TRANSACTIONS
OF THE
AMERICAN DENTAL ASSOCIATION.

Serial
v.1-2
1860-62
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School of Dental and Oral Surgery

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TRANSACTIONS

OF THE

American Dental Association,

HELD IN

WASHINGTON CITY, JULY 31, 1860,

ALSO THE

Proceedings of the Preliminary Meeting,

HELD AT NIAGARA FALLS, AUGUST 4, 1859

CINCINNATI:
WRIGHTSON & CO., PRINTERS, 167 WALNUT STREET.
1860.

& 1862

PREFACE.

The Committee on Publication, though not instructed by the Association, has concluded to publish the transactions of the Association in a volume. This will embrace the Proceedings of the Preliminary Meeting held at Niagara Falls, August, 1859, and the Minutes of the Meeting held at Washington City, July, 31, 1860, together with the Constitution, By-Laws, and Essays read before the Association.

It is thought best to publish the transactions in this form, for they will be thus best preserved for reference.

The Proceedings of this Association will be of interest to the Profession, and it is important that they be put in proper form for reference, and that all who desire, may have the opportunity of procuring a copy.

In this work, the members of the committee feel that they are carrying out the wishes of the Association, and also acting in accordance with the desires of the Profession generally.

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TRANSACTIONS.

PRELIMINARY MEETING.

NIAGARA FALLS, August 3d, 1859.

The delegates appointed by the various existing Dental Associations to meet at this time, with a view of forming a a National Delegated Association, met according to previous notice. Dr. W. W. Allport was chosen chairman, and Dr. J. Taft, Secretary.

In entering upon the discharge of his duties, the chairman stated the object of the meeting, and remarked that whilst it was a matter of regret that the number of societies in the country was so limited, it was gratifying to find such a fair representation present from the existing associations. The secretary was then requested to read the memorial that had induced this movement.

Memorial.—The undersigned practitioners of dentistry, believing that a National Association of Dentists, composed of delagates from State, county, and local societies, and Dental Colleges, would be calculated to promote the best interests of the profession, respectfully suggest to the Dental Societies and Colleges throughout the country, the propriety of electing delegates to meet in Convention, at the Falls of Niagara, on the first Wednesday of August, 1859, for the purpose of forming, if the assembled delegates shall deem it expedient, a National Association upon a representative basis.

On motion,

Resolved, That a committee of three be appointed to examine and report on credentials.

Committee.—Drs. Taylor, Wright, and Suesserott.

Upon examination the following persons were found to be duly authorized delegates, and present:—

Mississippi Valley Dental Association.—S. L. Hamlin, H. McCullum.

Ohio Dental College Association.—H. A. Smith, Jos. Rich-

ardson, J. T. Toland, J. Taft, G. W. Keely, Geo. Watt, E. Taylor.

Pennsylvania College of Dental Surgeons.—Wm. Calvert.

Western Dental Association.—D. W. Perkins, W. W. Allport.

Penn. Association of Dental Surgeons.—J. H. M'Quillen, J. L. Suesserott, T. L. Buckingham, Geo. T. Barker.

Indiana State Dental Association.—J. F. Johnston, A. M. Moore, P. G. C. Hunt.

St. Louis Dental Association.—H. J. McKellops, I. Forbes.

Pittsburgh Dental Association.—W. M. Wright, R. Vandervort.

Cincinnati Dental Association.—C. H. James, J. G. Cameron.

Ohio Dental College.—James Taylor.

J. L. Suesserott,
W. M. Wright,
Jas. Taylor,
} *Committee.*

The following was then offered by Dr. J. H. M'Quillen, of Philadelphia:

Resolved, That a committee, composed of one member from each delegation present, be appointed to draft a Constitution, and submit the same to the Convention, its final adoption to be left until the next annual meeting.

Several amendments were offered, but the original resolution prevailed, with a slight modification, moved by Dr. J. F. Johnston, of Indiana, that the committee should consist of three members.

Drs. J. H. M'Quillen, Wm. M. Wright of Pittsburgh, and Jos. Richardson, of Cincinnati, were appointed the committee.

Thursday, 4 P. M.

The delegates met according to adjournment. The Committee on constitution for the proposed Association was called upon and reported. Before reading the constitution, Dr. M'Quillen took occasion to make the following prefatory remarks:—

Mr. Chairman and Gentlemen :—The committee appointed by this Convention to draft a Constitution, beg leave to state that they have attended to the duty assigned them; and would respectfully offer the following plan of organization. Trusting that its imperfections and short-comings may be remedied by *your reflections* and the *judgment* of *those* who shall participate in the final adoption of a *Constitution* for the proposed Association. A due regard for our own reputation as well as a just appreciation of the rights of others, make it obligatory that we should state, and desire the same to be placed upon record that, the plan of organization we submit to you is based upon a constitution that was framed by some of the brightest and best minds of our Country, after years of deliberation. We refer to the American Medical Association.

After which the report was read.

On motion of Dr. James Taylor,

Resolved, That the report be referred back to the committee, with instructions to mature and amend, if necessary, and publish in the Journals as early as next November.

On motion,

Resolved, That this Association holds its next meeting in Washington City, on the last Tuesday in July, 1860, at 12 M.

On motion,

Resolved, That this Association suggest to the Dental practitioners residing in sections of the country, where there are no local or state societies, the propriety of forming such Associations, and electing delegates to meet this Convention at its next meeting.

On motion,

Resolved, That the delegates representing this Convention to be held next July, be practitioners of Dental Surgery, and that each College be entitled to one delegate, and each Association be represented by one delegate for each five members.

On motion,

Resolved, That Dr. James Taylor be appointed a committee to procure suitable rooms, and make all necessary arrangements for the next meeting.

On motion of Dr. Taft,

Resolved, That five persons be appointed by the chairman to prepare Essays to be read at the next meeting.

The following persons were appointed, each selecting his own subject.

Dr. J. TAFT. "Secretions of the mouth—Saliva and Mucus."

Dr. M'QUILLEN. "The Anatomy, Physiology, Pathology, and Treatment of the fifth pair of Nerves."

Dr. JOS. RICHARDSON. "The agencies concerned in the removal of the roots of the deciduous teeth."

Dr. GEO. WATT. ———

Dr. T. L. BUCKINGHAM. "Electricity—its connection with Dentistry."

Adjourned to meet at Washington City, D. C., on the last Tuesday of July, 1860. J. TAFT, Sec.

TRANSACTIONS.

AMERICAN DENTAL ASSOCIATION.

WASHINGTON, D. C., July 31, 1860.

THE delegates of the various local dental Associations and Colleges met according to adjournment, in the Smithsonian Institute, in Washington City, D. C., at 12 o'clock, M., July 31, 1860.

The President, Dr. W. W. Allport, on taking the chair, made the following remarks:

GENTLEMEN:—Something over a year ago it was proposed by several eminent practitioners of Dental Surgery, that the interests of our profession would be promoted by the formation of a National Dental Association upon a representative basis. To ascertain the opinion of some of the leading Dentists in this country as to the expediency of forming such an association, a memorial was sent to several of our principal cities, for the signatures of those who approved the formation of the proposed association.

The memorial reads as follows:

The undersigned practitioners of Dentistry, believing that a National Association of Dentists, composed of delegates from State, county and local Societies and dental Colleges, would be calculated to promote the best interests of the profession, respectfully suggest to the Dental Societies and Colleges throughout the country, the propriety of electing delegates to meet in Convention at the Falls of Niagara on the first Wednesday of August, 1859, for the purpose of forming, if the assembled delegates shall deem it expedient, a National Association upon a representative basis.

In a few weeks there were names enough attached to this memorial to warrant its publication in the journals of the pro-

fession. In compliance with it, two of the Dental Colleges, and the Societies then existing, elected delegates, to meet in Convention, for the object, and at the time and place proposed. At the appointed time, the delegates met, but after mature deliberation, it was concluded that it would be better to postpone the final action in regard to the matter for one year.

A Constitution, however, was drawn up, and has been published in our Dental Journals, which is now to be submitted to you for your consideration.

By some, it may be supposed that it is the wish of the committee who submitted this Constitution, that it be adopted at the present time, without any *material* change, *nolens volens.* I have reason to believe that this is not the case, but that it is the desire of the committee that every section of it be carefully and thoroughly discussed, without fear or favor and that it be adopted, wholly or in part, or rejected entirely and a new one substituted in its stead, as it may seem to you the best calculated to promote the interests of the profession.

Trusting that the Chair may receive your kind and cordial support, without which our labors would result in discord and unprofitableness, and hoping that a spirit of trust and harmony may pervade all our deliberations, and guide us to fortunate results therein, we will now proceed to the business for which we are assembled.

The Minutes of the preliminary meeting were read, amended and approved.

On motion of Dr. Barker,

Resolved, That a committee of five be appointed to examine and report on credentials.

The Chair appointed upon that committee, Drs. Geo. T. Barker, F. Y. Clark, C. P. Fitch, A. Blake, P. G. C. Hunt.

On motion, adjourned to meet at 4 o'clock, P. M.

4 o'clock, p. m.

The Association met according to adjournment

The Committee on Credentials made the following report:

Gentlemen:—The Committee on Credentials respectfully report, that upon examination, the following gentlemen were found to be duly elected delegates to this Convention:

Washington City Dental Association.—Drs. J. B. Gibbs and H. W. Wadsworth.

Georgia Dental Association, Savannah.—Dr. F. Y. Clark.

Cincinnati Dental Ass'n.—Drs. J. Taft and H. R. Smith.

Mad River Valley Dental Society.—Dr. Wm. A. Pease.

Pennsylvania Association of Dental Surgeons.—Drs. S. Dillingham, J. H. M'Quillen, J. Foster Flagg, C. P. Fitch, J. W. Van Osten, J. McFarland, B. M. Gildea and Geo. T. Barker.

Pennsylvania Col. of Dental Surgery.—Dr. J. L. Sueserott.

Western Dental Society.—Drs. W. W. Allport and A. Blake.

Indiana State Dental Association.—Drs. P. G. C. Hunt and S. B. Smith.

Kentucky State Dental Association.—Drs. W. M. Rogers and A. S. Talbert.

Mississippi Valley Dental Association.—Dr. W. H. Atkinson.

Michigan Dental Association.—Dr. Wm. Cahoon.

Geo. T. Barker,
C. P. Fitch,
Aaron Blake,
P. G. C. Hunt,
F. Y. Clark,
Com. on Credentials.

The Committee appointed to prepare a draft of a Constitution was called upon, and made a report in accordance with their appointment.

On motion,

Resolved, That the draft of a Constitution presented by the committee be accepted, and the committee discharged.

Resolved, That the Constitution be taken up article by article, seriatim, considered, and disposed of.

After being duly considered and amended, it was adopted, and is as follows:

CONSTITUTION.

ARTICLE I.—NAME.

This organization shall be known by the name of the *American Dental Association.*

ARTICLE II.—OBJECTS.

The objects of this Association shall be, to cultivate the science and art of dentistry, and all its collateral branches, to elevate and sustain the professional character of dentists, to promote among them mutual improvement, social intercourse, and good feeling, and to collectively represent and have cognizance of the common interests of the dental profession in every part of the United States.

ARTICLE III.—MEMBERS.

SECTION I.—The members of this Association shall be exclusively practitioners of dentistry, holding their appointment to membership either as delegates from local institutions, or as permanent members.

SEC. II.—The delegates shall receive their appointment from permanently organized dental societies and dental colleges in the Union, each delegate holding his appointment for one year.

SEC. III.—Each local society shall be entitled to send to the Association, one delegate for every five of its active members, and the faculty of each college to send one of its members as a representative.

SEC. IV.—The permanent members shall consist of all those who have served in the capacity of delegates. Each delegate and permanent member shall be entitled to debate and vote on all questions, and be eligible to any office in the gift of the Association.

SEC. V.—To defray the expense of printing the Transactions, and to meet other incidental expenses, the sum of two

dollars shall be assessed annually upon all the members present at meetings of the Association. No member who is not present at a meeting of the Association shall be required to pay the annual assessment.

SEC. VI.—Each member elect, prior to the permanent organization of the annual meeting, or before voting on any question after the meeting has been organized, must sign these regulations, inscribing his name in full, specifying in what capacity he attends, and if a delegate, the title of the institution from which he has received his appointment.

SEC. VII.—No one shall be permitted to address the association before giving his name and residence, which shall be distinctly announced from the chair.

ARTICLE IV.—MEETINGS.

The regular meetings of the Association shall be held annually, and commence on the last Tuesday in July. The place of meeting shall be determined each year by vote of the association.

ARTICLE V.—OFFICERS.

SEC. 1.—The officers of the Association shall be a President, two Vice-Presidents, Corresponding Secretary, Recording Secretary, and a Treasurer. Two or more nominees for each office shall be presented by a special committee of one from each delegation, and shall be voted for separately by ballot, a plurality of votes being necessary for an election. Each officer shall hold his appointment for one year, and until another is elected to succeed him.

SEC. 2.—The President shall preside at the meetings, and perform all the duties that custom or parliamentary usage may require.

SEC. 3.—*The Vice-President.* In the absence of the President, one of the Vice-Presidents shall assume all the duties of the office; and in the absence of these officers, a chairman *pro tem.* shall be appointed *viva voce.*

Sec. 4.—The *Corresponding Secretary* shall attend to the correspondence with the Association, and give due notice of the time and place of each annual meeting.

Sec. 5.—The *Recording Secretary* shall keep accurate minutes of the proceedings of the Association, preserve the archives and unpublished transactions, and attend to all other duties that appertain to the office.

ARTICLE VI.—STANDING COMMITTEES.

Sec. 1.—The following Standing Committees shall be organized at every annual meeting, to prepare, arrange and expedite business for each ensuing year, and to carry into effect the orders of the Association, not otherwise assigned, namely: a Committee of Arrangements, of Publication, on Prize Essays, on Dental Physiology, on Dental Chemistry, on Dental Pathology and Surgery, on Mechanical Dentistry, Dental Education, and Dental Literature.

Sec. 1.—The *Committee of Arrangements* shall be composed of three members, one of whom, if practicable, shall reside in the place at which the Association is to hold its next ensuing annual meeting. They shall be required to procure suitable accommodations for the meeting; to verify and report upon the credentials of membership; to receive and announce all essays and memoirs voluntarily communicated, either by members of the Association, or by others through them; and to select and announce, at the earliest period practicable after their appointment, subjects for discussion at the succeeding annual meeting.

Sec. 2.—The *Committee of Publication* shall consist of five members, of which the *Corresponding Secretary*, and *Treasurer* must constitute a part. They shall be authorized to employ a competent reporter to furnish an accurate report of the proceedings of each meeting. They shall superintend the publication and distribution of such portions of the Transactions as the Association may direct. This Committee

shall audit the accounts of the Treasurer, and present a statement of the same in the annual report of the Committee, which report shall specify the character and cost of the publications of the Association during the year; the number of copies still at the disposal of the meeting, and the funds on hand for further operations. The Committee shall be instructed to print, at the beginning of each volume of the Transactions, the following disclaimer, viz: "The American Dental Association, although formally accepting and publishing the report of the various standing committees, and essays read before the Association, holds itself wholly irresponsible for the opinions, theories, or criticisms therein contained, except when so decided by special resolution."

Sec. 3.—The *Committee on Prize Essays* shall consist of five members. Two prizes, consisting of medals not exceeding in value fifty dollars each, may be awarded to the best two communications reported on favorably by the Committee, and directed by the Association to be published.

Sec. 4.—The *Committee on Dental Physiology, and Dental Chemistry* shall be composed of three members each. It shall be the duty of each Committee to present yearly reports in their special departments, embracing, if practicable, the results of original investigations.

Sec. 5.—The *Committee on Dental Pathology and Surgery*, consisting of five members, shall have under consideration every thing that appertains to pathological conditions of the teeth and adjacent tissues, and the remedial agencies embraced under the head of operative dentistry. Improvements in the latter department, if expedient, shall be thoroughly tested, and reported on before the Association by this Committee.

Sec. 6.—The *Committee on Mechanical Dentistry* shall consist of five members, who shall receive and take cognizance of plans, improvements and specimens in this department, that may be presented by persons desiring to bring

them before the Association. The Committee shall be authorized to reject those they may deem unworthy of presentation.

SEC. 7.—The *Committee on Dental Education, and Dental Literature*, consisting each of three members, shall make annual reports on these important subjects. The selection of the chairman and members of the different committees, shall be referred to the nominating committee.

ARTICLE VII.—AMENDMENTS.

These articles may be altered and amended with the consent of three-fourths of the members present, at the subsequent annual meeting to that at which such amendment or alteration may have been proposed.

THE ORDER OF BUSINESS.

The order of business at the annual meeting of the American Dental Association, shall at all times be subject to the vote of three-fourths of all the members in attendance; and until permanently altered, except when for a time suspended, it shall be as follows, viz:

1. The temporary organization of the meeting, preparatory to the election of officers.
2. The report of the Committee of Arrangements, on the credentials of members.
3. The calling of the roll.
4. The reading of minutes.
5. The election of officers.
6. The reception of members not present at the opening of the meeting, and the reading of notes from absentees.
7. The reading and consideration of the stated annual reports from the standing committees.
8. The reading of essays.
9. The discussion of topics selected for the session.
10. The selection of the place of next annual meeting.

11. The appointment of standing committees.

12. Resolutions, introducing new business, and instructions to the permanent committees.

13. Unfinished and miscellaneous business.

14. Adjournments.

During the discussions upon the Constitution, a paper from the St. Louis Dental Association, containing some suggestions in regard to the Constitution, was offered by Dr. Blake. That Association having no delegate present, it was concluded to hear the suggestions; the paper was read by Dr. Blake.

Adjourned to meet to-morrow, at 10 o'clock, A. M.

WEDNESDAY, AUG. 1.—10 O'CLOCK, A. M.

The Association met according to adjournment.

The record of the proceedings of yesterday was read and adopted.

On motion of Dr. H. R. Smith,

Resolved, That this Association extend an invitation to members of the profession and others of Washington City, who may desire to be present during the deliberations.

On motion,

Resolved, That the Association now proceed to the election of officers for the ensuing year.

On motion of Dr. M'Quillen,

Resolved, That we now take a recess of fifteen minutes, that the various delegations may each select their member of the Nominating Committee.

On call, the following persons were found to constitute that committee, viz:

Drs. J. B. Gibbs, Washington City Dental Association; F. Y. Clark, Georgia Dental Association, Savannah; H. R. Smith, Cincinnati Dental Society; Wm. A. Pease, Mad River Valley Dental Association; J. F. Flagg, Penn. Association of Dental Surgeons; J. L. Suesserott, Penn. College of Dental Surgery; A. Blake, Western Dental Society; P. G. C. Hunt,

Indiana State Dental Association; W. Muir Rogers, Kentucky State Dental Association; W. H. Atkinson, Mississippi Valley Dental Association.

The committee retired, and after due consultation and deliberation, made the following report:

Your committee would report that the following nominations have been made, viz:

Dr. W. H. ATKINSON, *President.*
" J. B. GIBBS, 1*st Vice President.*
" W. CAHOON, 2*d* "
" J. TAFT, *Recording Secretary.*
" W. MUIR ROGERS, *Corresponding Secretary.*
" S. DILLINGHAM, *Treasurer.*

On motion,

Resolved, That a vote now be taken on the nominees presented by the committee.

Which being done, the nominees were found to be duly elected.

On motion,

Resolved, That the nomination and election of the various standing committees be postponed till the afternoon session.

The President appointed Drs. Rogers and M'Quillen to conduct the President elect to the chair.

On motion of Dr. Fitch,

Resolved, That we reconsider the resolution adopting the Constitution.

Resolved, That the fifth section of the Constitution be amended to read as follows: The officers of this Association shall be a President, two Vice Presidents, Corresponding Secretary, Recording Secretary, and Treasurer. Two or more nominees for each office shall be presented by the nominating committee; said committee shall consist of one member from each delegation, and shall be voted for separately by ballot; a plurality of votes being necessary for an election.

Adjourned to meet at 4 o'clock, P. M.

4 o'clock, p. m.

The Association met according to adjournment. The President in the chair.

The Minutes of the morning session were read and adopted.

On motion,

Resolved, That the thanks of the Association be tendered to Dr. W. W. Allport, as a testimonial of its appreciation of the able manner in which he has discharged his duties as President of this Association.

Resolved, That the Secretary be instructed to procure two books, one for the Constitution, By-laws, and signatures of the members; and one for the records of the Association.

On motion,

Resolved, That the Secretary be empowered to employ a competent person to transcribe the Constitution, as adopted, into a book suitable for the purpose, that the members may have an opportunity to sign the same.

On motion of Dr. Cahoon,

Resolved, That a committee of three be appointed to draft a Code of By-Laws for this Association.

The President appointed for this committee Drs. Cahoon, Allport and Suesserott.

The committee were requested to report at the earliest practicable period.

A paper from Dr. A. M. Moore, of Indiana, was received, read and ordered to be placed on file; and the thanks of the Association were tendered to Dr. Moore for his suggestions.

A paper was read by Dr. A. Blake, giving a history of the formation of the Western Dental Association, which was ordered to be placed on file.

On motion of Dr. W. M. Rogers,

Resolved, That this Association recommend to all dental practitioners throughout the Union the propriety of urging all students under their tuition to prosecute a Collegiate Dental education. Also, that we feel the importance and necessity of a high standard of literary and scientific attainments by the dental students.

A very spirited discussion arose upon this resolution, which elicited the free expression of opinion from all the members present.

Adjourned to 9 o'clock, A. M., to-morrow.

THIRD DAY.—9 O'CLOCK, A. M.

The Association met according to adjournment; the Minutes of the last session were read and approved.

The reading of essays being now in order,

Dr. J. F. FLAGG read a paper on the claims of dentistry on dentists. It was received and ordered to be placed in the hands of the publishing committee.

Dr. FITCH presented and read a paper on extraction of the teeth, which was received and ordered to be placed in the hands of the publishing committee.

Dr. GEO. F. BARKER presented and read a paper upon the demands of the dental profession. It was also received and placed in the hands of the publishing committee.

Dr. TAFT read a paper upon the buccal secretions. It was also ordered to be placed in the hands of the publishing committee.

Dr. M'QUILLEN presented and delivered a synopsis of a paper upon the anatomy, physiology, pathology and remedial treatment of the fifth pair of nerves. Illustrations were given from a fine model.

The Committee on By-Laws was called upon, and made the following report:

Your committee would most respectfully submit the following By-Laws for your consideration, viz:

BY-LAWS.

I. OF THE PRESIDENT.

The President shall preside at all meetings, keep order, state and put questions, regulate debates, and sign all orders on the Treasurer, duly passed by the society. He shall not discuss any question while in the chair, unless it be a question of order. He shall have no vote, except when his vote may be necessary to decide a question upon a call of yeas and nays, or upon a ballot, except in the ballot for officers.

II. OF MEMBERS.

Each delegate, prior to being considered a member of this Association, shall sign the Constitution and pay the annual assessment.

III. CONDUCT OF MEMBERS.

Any act of special immorality or unprofessional conduct, committed by a member of this Association, shall be referred to the Committee of Arrangements, whose duty it shall be to thoroughly examine into the case and report at the next meeting, if the charges be sustained. Whereupon, by vote, the offending member may be reprimanded or expelled, a two-thirds vote being required for expulsion, a plurality being sufficient for reprimand.

IV. DEBATE.

No member shall be permitted to address the chair more than twice upon the same subject,—nor shall he consume more than fifteen minutes, unless by consent of the Association.

ADDITIONS TO BY-LAWS.

These ByLaws may be amended or added to by a vote of two-thirds of the members present at any regular meeting.

In acknowledgement of having adopted the foregoing propositions, and of our willingness to abide by them, and use our endeavors to carry into effect the objects of this

Association, as above set forth, we have hereunto set our names. The following persons signed the Constitution and By-Laws:

S. Dillingham, J. H. M'Quillen, C. P. Fitch, Geo. T. Barker, J. Foster Flagg, J. W. Van Osten, Philadelphia, Penn Dental Association.

Danl. McFarlan, Washington City, Pa. Dental Association.

B. M. Gildea, Harrisburg, Penn. Dental Association.

J. L. Suesserott, Penn. Dental Association.

Wm. Cahoon, Detroit, Mich. Dental Association.

A. S. Talbert, Lexington, Ky., Kentucky State Dental Association.

W. M. Rogers, Shelbyville, Ky., Kentucky State Dental Association.

F. Y. Clarke, Savannah, Ga., Georgia State Dental Society.

W. A. Pease, Dayton, O., Mad River Valley Dental Association.

A. Blake, St. Louis, Mo., Western Dental Society.

J. Taft, H. R. Smith, Cincinnati, O., Cincinnati Dental Society.

W. H. Atkinson, Cleveland, O., Miss. Valley Association.

J. B. Gibbs, H. N. Wadsworth, Washington, D. C., Wash ington Dental Association.

W. W. Allport, Chicago, Ill., Western Dental Society.

P. G. C. Hunt, S. B. Smith, Terre Haute, Ind., Indiana State Dental Association.

On motion of Dr. Allport,

Resolved, That the American Dental Association most respectfully recommend to our Dental Colleges the necessity of being more particular in requiring of their matriculants a higher order of general literary and scientific education; and the strictest enforcement of their standard requirements for graduation.

On motion of Dr. Van Osten,

Resolved, That a committee of three be appointed to confer with dental practitioners throughout the Union, with a

view to the formation of local Societies, and to report to this Association, at its next stated meeting.

The Chair appointed upon that committee, Drs. Van Osten, Allport and Rogers.

Adjourned to 4 o'clock, P. M.

4 O'CLOCK, P. M.

Association met according to adjournment. The members signed the Constitution and paid dues.

The Committee on Nominations made the following report:

Com. of Arrangements—Drs. Cahoon, Atkinson and Fitch.

Committee on Publication—Drs. Taft, Rogers, Allport, Dillingham and Van Osten.

Committee on Prize Essays—Drs. Hunt, Gildea, Clark, Rogers and Suesserott.

Committee on Dental Physiology—Drs. M'Quillen, Barker and M'Farlan.

Committee on Dental Pathology and Surgery—Drs. Suesserott, Atkinson, Flagg, Hunt and Allport.

Committee on Mechanical Dentistry—Drs. S. B. Smith, Blake, Talbert, Dillingham and Wadsworth.

Com. on Dental Education—Drs. Rogers, Fitch and Hunt.

Com. on Dental Literature—Drs. Barker, Gibbs and Taft.

Com. on Dental Chemistry—Drs. Pease, Taft and Van Osten.

These nominations were confirmed by the Association.

On motion,

Resolved That the next annual meeting of the American Dental Association be held in the City of Cleveland, Ohio.

Prof. BRAINARD, of Cleveland, Ohio, was introduced to the Association, and made some very interesting remarks upon Chemistry as connected with the teeth.

On motion,

Resolved, That the thanks of the Association be tendered to the Regents of the Smithsonian Institute; and that the Recording Secretary be instructed to pay the Janitor's fees, and any other indebtedness that may have accrued in taking care of the Hall during the sessions of this Association.

Adjourned to meet in the City of Cleveland, Ohio, on the last Tuesday of July, 1861, at 10 o'clock, A. M.

J. TAFT, *Sec'y.*

ESSAYS.

THE CLAIMS OF DENTISTRY UPON DENTISTS.

BY J. FOSTER FLAGG, D. D. S.

Read before the American Dental Association, Washington, D. C., Aug., 1860.

In this country, during the past few years, and within the recollection, probably, of every member of this Association, earnest efforts have been made for the elevation of dentistry, as a science, by those whose attainments were of that character which enabled them to fully realize the importance of that branch of medicine which they practiced, and the consequent value which should be accorded it, as promoting in no slight degree the enjoyment of personal comfort and health, while bestowing its acknowledged benefits in the direction of personal appearance.

That these labors have been fruitful is apparent to all practitioners, in the enviable position accorded to American dentistry by the whole civilized world; but I believe that, to the minds of those who have labored most fervently and with the highest aspirations, an assurance of even more worth and more solidity is now afforded, in the present gathering together of a body of dentists having the customary requisite for the establishment of authority, in the fact that they are regularly *delegated* to represent the combined interests of the local associations throughout our land.

This act has, at length, afforded a tangible foundation for the erection of a superstructure which shall prove the truth or the fallacy of the claim of our specialty to that high position which has been demanded for it, in the assertion of its worthiness to be regarded as a legitimate scion of that boon to humanity, the Practice of general Medicine.

This act may well be regarded with pride, as the consummation of the exertions of our predecessors. It now rests with us to fitly prosecute a work so nobly begun, and it has seemed to me that it would be well for us were we at this time to devote a few moments to the presentation and thoughtful consideration of what the *proper* (I use the word in its highest acceptation) prosecution of our calling, for which we have claimed so much, demands in return from us.

It claims from its practitioners a degree of combined moral, physical, and general intellectual attainment, equal to, if not greater, than that of any other calling.

I present the position in this plain manner, knowing that at first it will seem arrogant and untenable ; but I think that careful scrutiny will show alike its apparent arrogance to be but due appreciation, and the propriety, at least, of the actions and qualifications of its legitimate practitioners being such as to warrant the assertion.

Called to associate in very intimate professional relationship with the old and the young of both sexes, with the wealthy and the comparatively poor, with the educated and the ignorant, with the amiable and the irritable, with the relying and the self-reliant, it requires a knowledge of human nature, by no means superficial, to enable the dentist so to comport himself as to render his intercourse *acceptable* to all, maintaining at the same time his relative social position and his professional superiority ; and this is the more true in that the dental services involve infliction of bodily suffering, as well as alleviation from pain, and that patients are generally in full possession of their appreciative faculties.

Again, many require to be amused, others interested, not merely children, but those of larger growth ; and to do this successfully, implies not only remarkable adaptiveness, but a fund of resource and information such as few are able to draw upon. How often may the seed be sown, in the familiar conversation of the office, that shall stimulate to such investigation and application, in various directions, as shall be of in-

calculable advantage to those upon whose brain the seed has fallen. How often may the germs of fortitude, decision, truthfulness, or thoughtfulness, be so securely ingrafted as to play a most important part in the development of individual character, shedding their benign influence not only over the inner life of their possessors, but around upon all those with whom they may associate! And this, also, is the more true in that as humanity is constituted, deception, vacillation and thoughtlessness is the rule instead of the exception. What is the moral influence upon a child who is enticed to the dental office under the pretense of accompanying a parent in the fulfillment of an appointment, and, when there, is induced to submit to an examination, and has a tooth extracted upon the assurance that it is only to be "*looked at?*" Is not the name of "dentist" synonymous with all that is bad and to be feared? The parental conduct is almost universally overlooked, and the operator, as the deceiver and inflictor of pain, is the object of resentment and detestation. How different has been that influence which results in both young and old placing implicit confidence in whatever their dentist tells them, feeling that what he says must be so, *because he says it!*

Dentistry presents peculiar claims upon its practitioners in a physical point of view. The advantages of personal appearance, of intelligent physiognomy, and gentlemanly bearing, are too palpable in the prosecution of any professional avocation to require more than the most casual notice. In this, our own calling partakes to a certain extent; but there are *more points* dependent upon physical conformation which tend perfectly to adapt the dentist to dentistry than are absolutely requisite in any other profession. The perfect vision; the steady nerve; the delicate manipulative skill; rapidity of action; muscular strength; and, above all, the possession, in a high degree, of that most rare *combination* of brain, capability and manual dexterity,—all find ample field for the exercise and establishment of their superiority in the duties which devolve upon us. We see daily the advantage which would ac-

crue to us from ambidexterity, and time and again regret that we have not one arm and hand *more* than is usual with mankind.

In its moral claims, dentistry is unsparingly profuse—and I here assert that no man can be a good dentist unless he has a clear appreciation of these claims, together with the desire *and ability* to act in accordance with them—appreciation and desire are insufficient; appreciation and ability, I am sorry to say, are oftentimes insufficient; a combination of appreciation, desire and ability can alone produce a perfect result. The possession of these qualities must certainly argue a great degree of individual excellence in any avocation; but where much has to be left to the honor of the operator, much more responsibility of character should be demanded by the community. Work in dentistry has to be done thoroughly, in positions where, if done well, the dentist knows no other eye than his will ever rest upon it; his own consciousness of well doing, and his own satisfaction at success, are too frequently his only reward. *It is easy to ascribe a dozen reasons for any failure, all of which may be acceptable to patients, because they can not refute them; but success is almost always regarded by them as a mere matter of course.* It may be creditable to our profession that this is so; but it certainly detracts materially from the reward of honest endeavor.

Again, in the ordinary prosecution of clerical, legal, or medical duties, an opinion as to ability can be formed, based upon reliable data, in a comparatively short space of time. Sermons and manners are liked or disliked, cases are lost or gained, diseases are conquerors or conquered, and the results show themselves promptly; but almost all of our operations can be sent forth worthless, and even the simplest require at least a year or more to prove them so. That the knowledge of this is a powerful incentive to make "reputation" the cloak for much deception, is, alas! too glaring to pass unnoticed; and it should be ours, for each to add his mite toward wiping out so gross a blot upon our escutcheon. The fact

that the easiest operations are the most compensating, tempts many an unworthy man to the manufacture of cavities, for the mere purpose of the introduction of plugs! This process of drilling is generally preceded by a dissertation on the extreme hardness of enamel, and the impossibility of making any impression upon it with the finest instruments, unless caries has marked it for its victim! The utter falsity of this position should be constantly impressed upon patients, that being forewarned, they may be forearmed, and made to understand the immediate pecuniary necessity for a proper choice in their dental selection. They should be shown, whenever occasions offer during the performance of operations, the great facility, on the contrary, with which large openings may be pierced, even to the pulp cavity, through solid tooth substance, and thus be *made to see* with how little labor they may be deceived and defrauded.

The dentist should be governed by the highest moral influences in his intercourse with patients. Around the clergyman is thrown the sustaining aid of religion, of position, of association; all tending to make him wary in his walk of life, taking heed lest he fall, and knowing well the universal opprobrium which would visit any deviation from what is regarded as his proper path. Around the physician is thrown the barrier of the patient's home; the universal presence of members of their families; the existence of constitutional disease and its general concomitants, of weakness, suffering, and distaste of other than absolutely professional intercourse; while the dentist has not only to combat the almost total absence of all these, but the absolute presence of every facility for yielding to temptation, and for inducing others to do so. This state of things *must* continue from the nature of our operations. Our patients *must* come to our offices; they *must* come frequently; they *must* come at the hours which suit our convenience and the exigencies of the case; they *must*, from the length of duration of visits, frequently come alone, or seriously inconvenience friends or relatives; and, therefore, it

becomes necessary that every confidence may be placed in the proper influence of association with the practitioner. This subject also should be looked full in the face ; it should have its fair presentation before the community, and he who passes this ordeal unscathed, *should* reap a rich reward. I would that time permitted the introduction of many other points in regard to dentistry's claims upon its followers, such as attention to cleanliness, methodicity, diligence, the abnegation of all disagreeable habits, attention to business, etc., etc.; but, hoping that enough has been said to establish for its proper prosecution a standard of mental, physical, and moral quality, far above what is usually accorded it, I lay the matter before you, earnestly soliciting a united, continued, and hearty effort to place our art upon an eminence in this direction equal to that which it has at length obtained in the ascent of the rugged hill of science.

EXTRACTION OF TEETH.

BY C. P. FITCH.

Read before the American Dental Association, Washington, D. C., August, 1860.

THE remarks which I submit for your consideration are a few general thoughts on the extraction of teeth. That great improvement has marked this branch of dental surgery, since the revival of the forceps as an instrument for extraction by Mr. Cartwright, an eminent dentist of London, about the year 1830, and which has now so fully taken the place of the key of Garengeot, none, perhaps, will feel disposed to question; yet this operation is of such frequent occurrence that it is very apt to be ranked among the minor duties of dental practice, and considered of such little consequence as to demand but a slight expenditure of physical energy and very little culture or skill to accomplish all desired results.

The estimate thus placed upon it has given occasion for the enlistment of those in its practice who are poorly quali-

fied to meet its demands and responsibilities, and in some instances, their professional conduct has been subjected to just censure and public condemnation.

In discussing this subject, I wish to confine my remarks to the consideration of the following particulars:

1st. The instruments of extraction.

2d. When and how this act is to be performed upon the different teeth.

3d. A few suggestions touching the general bearing and deportment of an operator in his office.

I do not propose to give a history of either tooth-drawing or a description of the various extracting instruments used at different periods; neither to notice the person by whom introduced, nor point out the time of their introduction into dental practice; but to direct my remarks, more particularly, to the consideration of the kind and form of instruments which the nature of things demands.

Instruments for extracting teeth should be so constructed as to meet, in their adaptation, the form and shape of the teeth, the application of force in the most feasible and direct manner, and the necessities of the case, in allowing that direction to be given to the force which meets with the least resistance, without endangering the mouth of the patient.

Of the instruments used at the present, the forceps and various styles of elevator (or *lingue de carp*) are the most appropriate; far superior to the key in many particulars. The force exerted in the use of the key is much greater than is actually required, from the fact that it is applied at right angles, or nearly so, with the tooth and jaw, and this direction is always lateral, whatever be the peculiar conformation or position of the tooth, or the thickness and strength of the surrounding alveolus. As there is great variety in the conformation of both crown and neck in the different classes of teeth, and many times in the same classes, describing the segments of a circle various in size, it is very evident that the jaws of the forceps should be so formed in the curvature of

their beaks as to meet this variety. To illustrate my position. The cervical anterior surface of the superior central incisors is larger than the posterior surface; the anterior jaw of the forceps should be constructed to meet this peculiarity; and, when thus formed, this accurate adaptation should prevent their being used for the extraction of any other class of teeth; indeed, there should be different sizes of forceps for these teeth, from the fact that they differ very much in their circular dimensions.

Again, of the two exterior roots of the superior molars, the cervical portion of the mesial root is the larger and more prominent; hence the two grooves of the external nibs of the forceps should meet this peculiar conformation. So with the instruments intended for the other classes of teeth; they should be accurately adjusted, embracing as much of the circle at the cervical portion of the tooth as possible. Failures, either in breaking the tooth or instrument, are many times more attributable to a want of this nice adjustment than to all other circumstances combined; for it is evident, that whenever the groove or grooves in the jaw of an instrument are either too large or small, the instrument must touch and press the tooth at one or two points only, and this unequal pressure is very liable to crush the tooth or snap the nibs of the instrument.

Again, the jaws of the instrument should be constructed so that they will neither strike the tooth too abruptly, rendering it liable to be cut off, nor too obliquely crushing the crown of the tooth before striking its neck. By following out this plan in the construction of instruments, six or eight pairs of forceps will be required for the superior teeth, and nearly the same number for the inferior set, and quite a number of smaller sizes and the various styles of elevators for root extractors. A minute description of these instruments is uncalled for. Forceps are now constructed on these principles, or at least so attempted; but to say that there is no room for improvement, would be undoubtedly a misstatement. Emi-

nent operators have their favorite forms and styles; but these general ideas should never be violated in their manufacture; and, whenever disregarded, must increase the probabilities of a failure in the operation.

With these general remarks upon instruments, I pass to notice the questions: When and how this act is to be performed upon the different teeth.

That many teeth are extracted, even at the present time, that should not be, is a fact too patent to be denied. Altho' the profession has rapidly advanced within the last decade of years, yet, in certain sections, there exists still a crying necessity for reform. Teeth that a few years since were extracted by the wholesale, are now readily restored to health, and rendered valuable as masticators, or preserved as ornaments to personal beauty.

Viewing the subject from this stand-point, made luminous by the testimony and experience of hundreds of eminent dentists of this and other countries, we insist that no tooth should be extracted until remedial agencies have been exhausted in vain for its preservation, or decomposition advanced so far as to render its restoration impossible. Thorough, persevering treatment and fang filling have done much in dental achievements; and let "*excelsior*" still be the motto in preserving, rather than in extracting teeth.

Some dentists gain quite an enviable notoriety as expert tooth-pullers. This quality, in itself, is very desirable, and highly commendable; but not so when brought into requisition by an indiscriminate slaughter of all aching teeth, and laying them dripping with gore at this unhallowed shrine of their ambition—and, instead of good Samaritans, binding up and mollifying (not with extract), they are metamorphosed into walking, breathing machines of torture; rioting in bone, flesh, and blood, and moved by an energy and zeal which, if properly directed, would be worthy of imitation. A catalogue of the good qualities of this class of operators is frequently met with in the public prints of the day. They no doubt be-

lieve in the maxim, that blessed is he who can blow his own horn, for whosoever bloweth not his own horn the same shall not be blowed!

As a general thing, we would recommend the removal of the *Dens Sapientia* after an exposure of the nerve. Neither should that be considered sound practice which leaves offensive, broken teeth, or infectious roots in the mouth, requiring nature to do, in her slow processes, for the patient what the dentist is either incompetent to perform or does not feel disposed to undertake.

We would urge the immediate removal of all ulcerated teeth or those threatened with abscess, where there is no hope or desire of making them serviceable again. Relief is thus much sooner afforded than by prophylactic treatment.

When extraction becomes necessary, there are a few points which it would be well always to consider: the age mental and physical constitution, the health of the patient, as well as the physiological and pathological conditions of the tooth and its surroundings.

Though unpleasant be the task of extraction, an operator should never for one moment question his duty, so far as success or the reverse may attend his endeavor. An honest, skillful effort, though unsuccessful, will neither involve him in serious difficulty nor compromise professional standing. But, admit that he does suffer unjustly, and his hard-earned reputation is stricken in the dust: should this be a sufficient cause for any swerving from an honest discharge of duty? Is not all this assumed in the assumption of dental practice? Surely, he who takes the opposite course is not entitled to the respect of the community, and must, sooner or later, experience its withdrawal, if not suffer in the loss of self-respect.

How this act is to be performed upon the different teeth involves a consideration of the following particulars:—The anatomy of the teeth and jaws; the force requisite; its application and direction. I do not propose a lengthy discussion of these points, but to do little more than to call attention to

the fact, that a knowledge of them is highly important to the successful practice of dental surgery.

The same class of teeth are not extracted with the same force from different mouths; neither are the different teeth removed by the same force from the same mouth. The difficulties or intricacies attending extraction are greatly enhanced by exostosis, the direction and shape of the roots, the strength and firmness of the maxilla, and the stage of the tooth's decomposition.

Mr. Tomes divides the act of extraction by the forceps into three stages; the seizure of the tooth, the destruction of the membranous connections with the socket, and its removal from the socket—and urges that each act be thoroughly executed before proceeding to its successor.

A few words in reference to the seizure of the tooth. It is quite important that the forceps be carried to the alveolus before an attempt is made to extract. Too much emphasis can not be placed upon this requirement. Some operators are very careless in this respect. They seize the tooth at a point between the neck and crown, instead of pushing it to the bony structure surrounding the tooth. Some one, when imparting instruction upon this subject, has said: Push the jaws of your forceps into the sockets as though you intended they should come out at the top of the head or under the chin.

The kind of force necessary to sever the membranous connection between the root and sockets may be either rotary or lateral, etc., depending upon the class, shape, and position of the tooth. The inferior wisdom teeth are, at times, the most difficult teeth to extract. The force as a general thing, should be upward and backward, forcing them toward the ramus of the jaw. This is easily accomplished, whenever the inferior second molar is in its place firm and healthy, by the use of the wisdom forceps or elevator. But, whenever this tooth stands alone, and is either malplaced or shaped, or is much advanced in decomposition, with fangs curved back-

wards on a line with the maxilla, the requisite force to extract properly is not so easily applied, and the ingenuity and patience of the operator is taxed severely. No definite rules can be laid down in such cases; circumstances must always suggest the means and govern the operation.

The inferior molars are frequently exceedingly difficult to remove. At times their fangs require to be separated, to prevent serious injury to the jaw. To illustrate:—A robust German, aged forty, bilious nervo-sanguineous temperament, presented himself for the extraction of an inferior right second molar. He remarked that three dentists had been unsuccessful that morning, after repeated trials, to remove it. On diagnosing the case, I found the tooth broken on a line with the alveolus, which was broad and heavy. The portion remaining in the jaw was sound and firmly planted. The teeth were large, of a very dense and flinty texture; had never had but one extracted, and the process was long and painful. After removing a portion of the alveolus, exposing about two lines of the tooth, with appropriate forceps an attempt was made to extract, but the effort was a failure. The portion of the tooth seized came off as perfectly as if it had been removed with a chisel. The roots were yet firm and remaining together. They were now separated, and readily extracted, with very little pain to the patient. On examination, they were found large, and very much converged, having a strong hold of the jaw, which rendered it impossible to have removed the tooth whole, without serious injury to the maxilla.

I will not pursue this part of the subject further, as the almost endless variety of conformation and condition of teeth forbids.

A statement of definite rules governing the deportment of an operator in every instance would be exceedingly difficult, and nothing more than generalities can be indulged in, leaving good sense to meet the individual demand.

A person entering a dental office to have an aching tooth

removed expects, and indeed is entitled to, a kind and appreciative reception. The first impression upon the patient is frequently the most potent in giving quality and character to the operation itself. The simple act of approaching the patient is often attended, either with an utter want of kind and gentlemanly behavior, or with an apparent abruptness, which must fasten upon the mind of the subject the impression of severity, indifference, or incompetency, either one of which is greatly to be depricated, and will most assuredly have its legitimate influence in repulsing, if not entirely defeating the operation.

It is quite important and desirable, in order to inspire confidence and secure ready submission, to impress the patient with the following characteristics; Integrity, skill, and a tender regard for physical and mental suffering.

Integrity is a fundamental quality in moral character, and is essential to great and enduring success to any employment of life. It imparts force, beauty, and symmetry to the character, and crowns the summary of superior gifts and excellent qualities; while dishonesty and deception defeat their own ends; and detract fully one-half from an otherwise skillful performance.

A promise of more than is warrantable, on the one hand, should never be made, and on the other, a brief statement of all the favorable circumstances which the case presents should never be withheld, whenever a desire is expressed to know them.

The least departure from truthfulness, either in statement or action, especially with a child, is unpardonable in an operator under any circumstances; very unhappy influences are left upon the mind connected with this operation, which a long life can not entirely dissipate. This period is one of implicit confidence, and childhood's trust and reliance should never be shaken or betrayed.

Excessive solicitude or urging on the part of the dentist is, oftentimes, excessive folly, defeating the very ends desired;

both insulting to the common sense of the patient and a departure from that natural dignity which is ever the mark of the highest style of man, and which should, especially, characterize the professional man.

The general excitement and dread attending this operation is often very great, especially where the subject is young, or a person feeble in health, with a nervo-sanguineous temperament; so much is this the case, that it is frequently deferred for months, and even years, until an agony of suffering forces submission. All such instances call for the exercise of great patience, candor, and gentleness, yet force and decision.

Promptness, self-possession, and determination, or, in one word, executiveness, coupled with ingenuousness and intelligence, will always establish in the mind of the patient the claim of skill and ability, without the blow of trumpets or the clash of arms. But, where these qualities are wanting, neither assumed nor conceded professional reputation, or vaunted scholastic advantages and endowments, will either supply their place or efface the idea of rudeness, inefficiency, and arrogance. Real merit and quality should be the basis of professional character—for the universal law of equilibrium must eventually determine the standing of every man.

When approaching this operation there should never be a great flourish of instruments, by a studied arrangement of them before the eye of the patient, as though an expectation was entertained that their use might be necessary before success should crown the effort; neither should this inauspicious moment be the occasion for sharpening the lancet, and in sundry ways to test the keenness of its edge. These, and many other things which might be enumerated, though thoughtlessly performed, and in themselves trifles, depend upon it, have their influence, and will detract very much from the aggregate of those manly qualities which constitute the true gentleman, the ripe scholar, and the finished and expert operator.

Thanking you, gentlemen, for your kind indulgence, I close with this sentiment:—

The Dental Surgeon—May his ingeniousness, erudition, skill, and integrity ever be commensurate with the demands which the age has upon his profession.

THE DEMANDS OF THE AGE UPON DENTAL SCIENCE.

BY GEO. T. BARKER, D. D. S.

[Read before the American Dental Association, Washington, D. C., Aug. 1860.]

It may be well at this time to stop for a moment and consider what are now the true demands upon the dental profession, and enquire whether those demands are being met by hearty and earnest colaborers, in a profession that has the high and praiseworthy aim of alleviating human suffering, and whose office is the restoration of health and happiness to suffering humanity. It may be well for us to glance at the great advancement in dental science during the past fifty years, and our hearts must be filled with honest pride that our noble art has won so honorable a position; but let us consider how this has been accomplished. To me it seems as if a comparatively few men have lifted our science to its elevated position, while the majority have looked on, enjoying the fruits of these labors without the slightest return; and, indeed, too often depriving them of honestly won laurels.

But to continue, let me ask what are *now* the *demands* upon our profession from our *patients?* and how far are they *met?* It is in vain that we may claim that our science has reached an approximation to perfection; for we must grant that the demands of the age are, for, far less painless operations than we can now perform. Do we not at this very time need some agent that will destroy the dental pulp without the intense pain that too often has to be suffered by the afflicted patient, an agent that can be used with impunity in the deciduous teeth of children, without danger to those teeth that are

present in the mouth, and those delicate ones that are being developed in the alveolar arches? This, I would contend, is a demand of the age; and who shall supply it? Who shall present to the notice of the profession an agent that shall accomplish these results, lessening also the ratio of failures, which are now attendant upon our practice?

There is another demand which, to me, seems quite as important as the preceding one, and that is for a different treatment in cases of *sensitive dentine*. It may do for some to assert that from this pathological condition (for I claim it as a pathological condition) they have no trouble, their patients being relieved by a few direct cuts from a sharp excavator; but personal experience and observation teach me to the contrary. There is, therefore, a demand from our patients upon us for an improved method of treatment; some agent that will act as a palliative, while it will not affect unfavorably the sensitive pulp, or destroy the surrounding tooth substance; an agent that will give our patients a confidence to come to us in the earliest stages of carious action, and not wait, as is too often, and I might almost say universally the case, until complete exposure of the dental pulp has occurred. The great dread which our patients now too often feel for our art would then be removed, and a visit to the dental practitioner would not as now be associated with visions of hours of suffering and pain. I claim that there is nothing which so much discourages a universal resort to the benefits of our science as this one drawback. Then is not this a true demand of the age, and one that, if possible, should be supplied? I feel that it is, and that the attention of every hearty laborer in the field of dental science should be directed toward it.

The age also demands from the dental profession a *high order of operations* upon the teeth—work that shall be finished and permanent, protecting as much as possible the teeth from subsequent decay. Is this demand met? Unfortunately, we can not answer in the affirmative; for while there is a

goodly number, though in the minority, whose standard of work is high and praiseworthy, who meet the demand of the age in this direction with truth and honesty of purpose, there are too many who do not keep up to this standard, but graduate their work by the price paid, the number of operations to be accomplished in a given time, or relying too often upon the reparative process of nature to protect an exposed pulp by an ossific deposit, dismiss the patient, the tooth being frequently lost by such treatment. I repeat this in no invidious spirit, but with the sincere desire that the true demands of the age upon dental science may be met.

Again, there is a demand upon the profession for a higher order of acquaintance with different *pathological conditions*, and particularly in correct *diagnosis*. This must be apparent to every one present, for who has not seen "*nervepaste*" applied in a tooth where a pulp has not been present for years, or has not known of numberless pulps destroyed unnecessarily, and teeth needlessly extracted without number? I ask, who has not seen this? And therefore I answer, the true demand is not at present met. It is true, there are many who, as in operating, consider what is due to their p atients, their profession, and themselves; and, acting accordingly, found their diagnosis and prognosis upon truly scientific principles, and are unwilling to blindly work or trust to the ignorance and credulity of their patients.

The age demands educated practitioners both in *literature* and *science*, with minds that can make the fingers work out the thoughts of the brain; not merely a scientific knowledge or a dexterous workmanship, however important both may be, but educated labor is the demand. And is this met? Unfortunately, we must answer again in the negative. A late dental magazine states "that the yearly addition to the profession does not fall far short of five hundred persons; of this number a little over *one-tenth only* are graduates of dental colleges? Can it be acquired from a private preceptor? I contend it can not, however conscientiously that duty may

be performed; and for these reasons, that the private preceptor can not make each department of dental science a particular and constant study. If delicate manipulation is his pride, perfection in mechanical work must necessarily receive a limited attention. Again, he has not the facilities for imparting that knowledge of Anatomy, Chemistry, Physiology, and Pathology, an acquaintance with which is as much needed by a dental practitioner for the basis of a sound practice, as it is important for him to possess sufficient strength to extract a tooth. This, therefore, is a demand, and a just one too, of the age, that should be met, one that as dentists, proud of our profession, we should uphold, and insist that *every young man* who now enters the profession should do so through the portals of our dental colleges, assisted, if possible, by conscientious preceptors; then, I feel well assured, that the time will not be far distant when the demands of the age will be fully met, and that our profession will not alone be willing to look back upon the past, but will glance with undimmed eyes to the future, confident of the same advancement that has characterized it during the last half century.

I have spoken of the demands of our patients upon us; I would now speak of our demands, one upon the other. This is, indeed, a subject of vast importance, for the day has, I think, gone by when an honest practitioner, wrapping his mantle about him, can say, "I will hold no communication with my professional brethren." The day, I repeat, is passing, for the demand is now for *concentrated* and *associated* effort. No practitioner can hold his own, or make his mark, who thus retires to his secret chamber; but the noble mind says, "freely have I received, freely will I give," and cares not for patent rights, but gives to the profession with an ungrudging hand the result of his labors, giving them too for what they are worth, prepared also to ignore them when proven they are wrong or impracticable.

I will conclude with a short reference to a demand of the age which has just been met. I refer to a National Dental

Association upon a strictly representative basis, which will, I feel assured, redound to the credit of the profession, stimulating *associated effort* in *local* societies, elevating the standard of dental science, creating upon every side a liberality, of sentiment that will win for our art the title of a liberal elevated, and scientific profession, and eventually the *true demands upon dental science* will be fully met.

THE BUCCAL SECRETIONS.

BY J. TAFT.

[Read before the American Dental Association, Washington, D. C., Aug. 1860.]

THESE natural products of the animal economy have received some attention and consideration by physiologist and pathologists all along through medical investigation, from the beginning to the present time.

In regard to the value and importance of these secretions, there has been some diversity of opinion, or rather in regard to their functions, though they have usually been regarded as playing a very important part in the incipient stages of digestion.

The insalivation of the food, at the time of mastication, *preparatory* to deglutition and digestion, have been considered the chief functions of the saliva. While these may be considered the prominent offices of this secretion, there are others accomplished by it of no insignificant character; such for instance as aiding in the enunciation of language. Without the moistening, lubricating influence of the saliva, how imperfectly, if at all, would language be uttered.

Again, this product could not be retained in the blood with impunity. It is necessary, for the health of the blood, that every secretion that nature designed should be withdrawn, be duly removed by its appropriate apparatus.

Within the scope of this paper we intend chiefly to consid-

er the buccal secretions, with reference to the influence upon the teeth, both in a state of health and disease.

It seems scarcely necessary here to enter into a minute consideration of these secretions in a state of health; since this has been so often and so elaborately done already. A few remarks here in regard to the nature, composition, and elaboration of the salvia, will, however, not be out of place.

The product usually found in the mouth is denominated mixed saliva. It consists of the secretions elaborated by the buccal mucous membrane, as well as by the various salivary glands.

The saliva, as ordinarily found in the human mouth, is an opalescent, or faintly blush-white fluid; it is viscid, tenacious, inodorous, and tasteless. After being at rest for a time, it deposits a grayish-white sediment; this consists principally of epithelium scales; these are not seen in the fresh saliva, but soon deposit themselves when the fluid is at rest, and exposed to the air; mucous corpuscles also exist to some extent in the saliva.

Unmixed Saliva.—The products of the different salivary glands exhibit some variety in composition. The saliva of the same person under different physiological conditions, will be different in some respects, and in none more than in specific gravity. Various circumstances will modify it in this particular; such for instance as the amount and character of the food.

Wright has demonstrated that human saliva is more dense after food has been taken than when fasting.

The saliva of a healthy man who had lived for a week on a mixed diet varied in density from 1·0079 to 1·0085, while after a purely animal diet for an equal time, it varied from 1·0098 to 1·0176; and after a purely vegetable diet from 1·0039 and 1·0047.

He also remarks that moral emotions, (rather mental emotions,) atmospheric changes, light, sound, etc., exert an

influence on the density of the saliva to range between 1·0069 and 1·0089.

Pure saliva should be obtained from the ducts of the salivary glands, in order that it may have no admixture of mucus, nor any foreign substance; it should also be obtained without the aid of irritants or stimulants. "A very simple and ready method of collecting a large quantity of saliva in a short time, is by exciting a strong pressure under the chin, and at the same time titillating the palate with a feather: a feeling of strangulation immediately ensues, during which the saliva is rapidly ejected from the mouth."

The glands that elaborate the saliva are the following, viz: the parotid, the submaxillary, and sublingual. The general features of the products of these different glands are very similar; though some have affirmed that a marked difference is found in many cases. My own experiments have shown but slight difference in the saliva from the different glands.

Pure saliva is perfectly limpid and colorless, without odor or taste, and incapable of being drawn out into threads, and of a distinctly alkaline reaction.

Prolonged hunger or the use of indigestible or stimulating food causes the secretion of concentrated saliva. During fasting it approximates, and in prolonged abstinence attains an acid reaction. It is definitely alkaline during and immediately after meals. Its character is quite variable under different pathological conditions; but of this hereafter.

The saliva always possesses the following ingredients:—

First—Potash, soda, and lime, combined with organic matter.

Second—An extractive matter soluble in alcohol, precipitable by tannic acid.

Third—Sulpho-cyanide of potassium.

Fourth—Potash salt.

Fifth—Epithelium and mucous corpuscles; these are very slight in pure saliva.

Sixth—Chlorides of sodium and potassium.

Seventh—Traces of phosphates.

There have been many experiments and analyses made upon the saliva, almost every one of which differs in some slight degree from all the others. These differences, however, are not greater than should be expected, owing to the different specimens operated upon, and the difference in the modes of conducting the experiments. Notwithstanding the descrepancies that have been exhibited by these different experiments, yet the leading features and characteristics have been manifestly the same, and fully established.

It is difficult to estimate the amount of saliva secreted in a given time ; there are so many circumstances that modify the quantity, that it is difficult to arrive at anything very definite in this respect.

It is regulated in quantity by the condition of the patient, either constitutional, or local, or both. When there is no abnormal condition it will be subject to fluctuations, dependent upon the character of the food employed, and the manner of using that food. Dry food calls forth more saliva than moist, and hard far more than soft; substances of a pungent or irritating nature more than the mild pleasant substances. The act of mastication is the most common exciting cause of the secretion of saliva.

The movement of the mouth in speaking and singing excites a flow, unless the speaker is in a high state of mental excitement; then the secretion may be arrested altogether, as is often experienced by timid speakers.

The flow of saliva continues for a brief period after the use of food. Food mixed with water requires very little saliva.

Colin, in his observations on the secretion of saliva in the solidungulous animals, remarks that the secretions of the two parotids alternate; the parotid of the side on which mastication is going on secretes at least one-third more than that of the other side; and when mastication is changed to the other side, the corresponding parotid goes vigorously to work; the action of the first partially ceases.

The same rule operates in the secretion of the human

saliva, though probably not to quite the same extent.

The parotid glands yield about two-thirds of the whole amount of the saliva elaborated; the submaxillary about one-twentieth, and the sublingual the remainder. The amount of saliva is governed by circumstances. During sleep there is little or no saliva secreted. The sight and odor of food will usually excite a flow of saliva, particularly if there is hunger. Nausea will generally excite a free flow of the buccal fluids; at such a time the mucous glands become especially active.

The various mental conditions operate variously upon the salivary glands: fear diminishes the secretion very much; fright checks it entirely; anger also diminishes it; while good humor and mirth increase the secretion. Erotic emotions increase the secretions of the mucus considerably, and that of the saliva to some extent. Grief augments the secretion of both the saliva and mucus.

Fluctuation in the quantity of water in the blood has but little influence upon the amount of saliva elaborated in a given period. Neither does it change the relative proportion of the solid constituents of the saliva.

The Objects of the Saliva.—Lehmann remarks, that the office of the saliva may be regarded as threefold, viz: mechanical, chemical, and dynamical.

Many kinds of food have but little moisture, and require to be moistened with the saliva in order that more perfect mastication may be accomplished, and especially that the act of deglutition may be accomplished with facility; it lubricates the bolus, and makes it manageable in the mouth. Perfectly dry food in the mouth is unmanageable. Without the moistening and lubrication of the food in the mouth, the mucous membrane would be irritated, and ultimately highly diseased by friction; this would result to the mucous membrane of the throat and œsophagus, as well as to that of the mouth.

The food is prepared by insalivation for being most perfectly acted upon by the digestive fluids. *The chemical* action

of the saliva upon the food is a question upon which there is much diversity of opinion; some maintaining that it serves only to moisten the food, and at that point its influence ceases; others contend that it exercises a concurrent influence with the gastric fluids throughout the process of digestion. There are some points, however, that are well established. By insalivation the food is much better prepared for being acted upon by the gastric fluids than if it was not moistened at all, or than if moistened simply with water. Again, starch is converted into sugar by the action of the mixed saliva. This is probably accomplished by the mucus. Experiments have been introduced that lead us to conclude that the unmixed saliva will not produce that result.

Lehmann remarks, "it can, therefore, no longer be doubted that the saliva in a normal condition, when it is mixed with the food, possesses the property of converting starch into sugar."

Wright considers that one of the more prominent functions of the saliva is that of stimulating the stomach, and thus promoting the digestive process. This rests, however, quite as much upon hypothesis as demonstration.

Pathological Conditions.—The diseased and unnatural conditions of the buccal secretions have not received that attention and investigation which we think the subject demands; this arises from the supposition that the subject is one of little importance, and from the difficulties attending such investigation.

The saliva is subject to many and great changes, by disease. The saliva proper may be changed from its natural to a definitely acid reaction; or it may be changed to more than its alkaline condition. This latter is exhibited when salivary calculus is rapidly deposited upon the teeth.

Any change of the mucus is usually to an increased acidity. When this condition is produced to such an extent that it is not neutralized by the saliva, as is generally the case when green tarter is deposited upon the teeth, it then becomes a source of mischief.

Probably in no cases except those of an extreme character is there any direct injury upon the teeth by these changes of the saliva; but that the decomposition of foreign substances in the mouth is greatly facilitated by these changes, there can be no doubt.

The extent of the injury resulting from vitiated secretions will be exceedingly various, depending upon a great variety of modifying circumstances.

The saliva becomes changed to an abnormal or diseased condition in two ways. First, by a vitiated state of the blood, and second, by a diseased condition of the glands; the latter is often complicated with the former. The saliva is more frequently affected by a deteriorated state of the blood; but the mucus by an unhealthy condition of the mucous follicles. These being situated in the mucous membrane near the surface, are more exposed than the salivary glands to the influence of local irritating causes.

The salivary glands are often required to perform more than the natural amount of labor, sometimes from local stimulants, as in the use of tobacco, or any similar agent; and from the constant use of the jaws in mastication, and from general constitutional causes, as in ptyalism, and various vitiated conditions of the blood.

When any organ is over-tasked, its production is necessarily deteriorated. A general inflamatory condition of the system produces an acid state of the saliva. Rheumatic affections, if general, produce the same result.

In febrile diseases the secretion of the saliva is very much diminished and sometimes checked altogether; then, the secretion of mucus being kept up, the teeth suffer injury, for the mucus, at such times, is always in a vitiated condition when secreted, and changes rapidly to a worse condition while in the mouth. The water evaporates and leaves a thick tenacious sordes covering the teeth, and lining the mucous membrane of the mouth. During this state of things, the teeth, without great care, are injured extensively and rapidly. The

utmost care should be exercised to keep the teeth clean during a time of sickness, and especially when this particular condition exists. Much of the injury attributed to medical agents is dependent upon just the state of things to which reference has been made.

This vitiated, thickened, decomposing mucus will act directly and with great rapidity upon the teeth. It also facilitates the decomposition of the foreign substances with which it may come in contact, or commingle, and thus indirectly operate an injury upon the teeth.

A peculiarly vitiated state of the saliva is often found in connection with a lymphatic temperament, especially where there is a strumous diathesis. The saliva is viscid, somewhat thickened, is easily drawn out into shreds or strings; it does not readily mix with the atmosphere, does not become frothy. Usually when there is this state of the saliva, the teeth decay very rapidly, and are very sensitive, especially if the constitution of the teeth is good or medium; but if they are poorly organized, the vitality may be destroyed in advance of the decay. Saliva in this condition operates rapidly upon the teeth, both directly and indirectly. All the care that can be bestowed upon the teeth in respect to cleanliness will not arrest caries nor change its character while the buccal secretions remain in the condition just described. The mucous membrane of the mouth is always in a more or less irritable condition in these cases, and this will be kept up during this state of the saliva, and probably by its influence chiefly.

In order to remedy the evil results from this condition of the saliva, it must be restored to health; this can only be done by constitutional treatment, for it doubtless depends upon a depraved state of the blood. The secreting organs are, doubtless, always more or less affected; but when the original cause of the difficulty is removed, the secreting apparatus will assume a normal condition and a healthy action.

There is another depraved condition of the saliva not so marked in character nor injurious in its effects as that just

referred to. It is characterized by a semi-oily condition; it is free from that tenacity and stringiness exhibited by some other depraved conditions. It insinuates itself into every interstice where it can at all approach; it will moisten the surface of the teeth when the utmost care is taken to protect them; the dentist will thus often find himself exceedingly annoyed by saliva of this character. Where it exists, it is almost impossible to keep an operation dry. This peculiarity is derived from the mucus, which in such instances is elaborated very freely.

The pathological changes and conditions to which the buccal secretions are subject is a matter upon which but little has been written, and less investigation made, especially with reference to their influence upon the teeth. It is a field in which investigation is somewhat difficult, yet there are no insurmountable difficulties in the way; it may be as thoroughly explored as some that have received much attention. It is an exceedingly important subject to the dentist and his patient; one that we all have neglected too long. Now in the future let us give the subject the attention its importance demands.

TRANSACTIONS

OF THE

American Dental Association

HELD IN

CLEVELAND, O., JULY 30, 1862.

Entered according to Act of Congress, in the year 1863, by the
AMERICAN DENTAL ASSOCIATION,
In the Clerk's Office of the Southern District of Ohio.

PREFACE.

The Committee of Publication after a long delay have issued the TRANSACTIONS OF THE AMERICAN DENTAL ASSOCIATION, held at Cleveland last year.

It has been impossible, owing to various circumstances, which need not be mentioned here, to issue this volume sooner. This was much to be regretted, as it was important for the profession to know what was done at that meeting, and also because there was much valuable matter lying unused. It is to be hoped that in future, such dealy in the publication of the proceedings will not occur.

JUNE, 1863.

TRANSACTIONS

OF THE

AMERICAN DENTAL ASSOCIATION.

THE American Dental Association held its regular annual meeting at Cleveland, July 29th, 1862, in the lecture room of the Medical College. The meeting was called to order at 3 o'clock P. M.; the President, Dr. W. H. Atkinson, in the Chair.

The following permanent members were present, to-wit: Dr. W. H. Atkinson, of New York; Dr. Wm. A. Pease, of Dayton, O.; and Dr. J. Taft, of Cincinnati.

The committee on credentials were called upon, and presented their report, as follows:

"Your committee would most respectfully submit the following: We have examined the certificates of the following named persons, and find them to be correct and valid; and would suggest that they be received as members of this Association, to-wit: Dr. J. F. Johnson, of the Indiana State Dental Association; Dr. H. Benedict, Michigan Dental Association; Dr. W. D. Stone, Kentucky State Dental Association; Dr. W. H. Allen, New York Society of Dental Surgeons; Dr. R. W. Varney, Brooklyn Dental Association; Dr. G. W. Ellis, Pennsylvania Association of Dental Surgeons; Dr. Geo. Watt, Ohio Dental College Association; Dr. H. A Smith, Ohio Dental College Association; Dr. J. A. Watling, Michigan Dental Association; Dr. B. Strickland, Northern Ohio Dental Association; Dr. C. Palmer, Northern Ohio Dental Association; Dr. B. T. Spellman, Northern Ohio Dental Association."

By request, the minutes of the last meeting were read.

On motion, *Resolved*, That the election of officers be the order of the day for 9 o'clock to-morrow morning, at which time the committee on nominations are requested to present their report.

Communications were received and read from the following persons, and ordered to be placed on file, to-wit: Drs. B. T. Whiting, T. H. Burras, J. L. Suesserott, J. H. McQuillen, J. F. Flagg, and G. H. Perrine.

On motion, *Resolved*, That the Association cordially invite the members of the dental and medical professions of this city and vicinity, and those from abroad who may be sojourning here, to be present with us during our deliberations.

Resolved, That the committee on Dental Pathology and Surgery be continued.

This was at the request of the chairman of that committee.

Adjourned, to meet at 9 o'clock to-morrow morning.

SECOND DAY.

Association met, according to adjournment.

Dr. Watt submitted the following:

WHEREAS, In view of a statement by Dr. Benedict, that the Michigan State Association authorizes its delegates to transfer their credentials; and whereas, Dr. J. Robinson has stated in writing that he could not attend this meeting, and desired his place to be filled; therefore,

Resolved, That Dr. John A. Watling, of said Society now reported by Dr. Benedict, be accepted as a delegate in the place of the said Dr. Robinson.

The nominating committee was now appointed, and consisted of the following members, to-wit: J. F. Johnson, Indiana State Dental Association; W. D. Stone, Kentucky Dental Association; Wm. A. Pease, Mad River Valley Dental Society; J. Taft, Cincinnati Dental Society; W. H. Atkinson, Mississippi Valley Dental Society; H. Benedict,

Michigan Dental Society; W. H. Allen, New York Society Dental Surgeons; R. W. Varney, Brooklyn Dental Society; G. W. Ellis, Pennsylvania Association Dental Surgeons; H. A. Smith, Ohio Dental College Association.

The committee on nominations submitted the following names as nominees, from which to select the officers of this Association, to-wit: For President, Drs. Watt, Pease, Allen, and Taft. First Vice President, Drs. W. H. Allen, Stone, and Pease. Second Vice President, Drs. Stone and Pease. Recording Secretary, Dr. Taft. Corresponding Secretary, Drs. J. F. Johnson and Ellis. Treasurer, Drs. Pease and Benedict.

On motion, the election of officers was now had, and resulted as follows:

President—Dr. GEORGE WATT, Xenia, O.
1st Vice-President—Dr. W. H. ALLEN, New York.
2d Vice-President—Dr. W. D. STONE, Lexington, Ky.
Recording Secretary—Dr. J. TAFT, Cincinnati, O.
Corresp. Secretary—Dr. J. F. JOHNSON, Indianapolis, Ind.
Treasurer—Dr. WILLIAM A. PEASE, Dayton, O.

Drs. Stone and Benedict were appointed to conduct the President elect to the Chair,—which, upon taking, he made some remarks, tendering the Association thanks for the honor conferred.

The following persons, from the Northern Ohio Dental Association, presented their certificates as delegates to this Association, which were received and approved, to-wit: Dr. Strickland, of Cleveland, Ohio; Dr. C. Palmer, of Warren, Ohio; and Dr. Spellman, of Ravenna, Ohio; who came forward and signed the Constitution and paid dues.

The committee on dental literature was called upon, and presented their report, which was ordered to be published. (For which, see another page of these Transactions.)

Adjourned to 2 o'clock P. M.

AFTERNOON SESSION.

Association met, according to adjournment.

The committee on Dental Chemistry presented their report, which was discussed at some length; after which, it was ordered to be published.

The report of the committee on Publication was presented and accepted.

On motion, *Resolved*, That the copies of the Transactions on hand be distributed to the new members.

Dr. Stone gave notice, that, at the next annual meeting, he will propose the following change in the Constitutiou, to-wit: in Article 3, Section 5, drop all the section after the word "members," at the last of the first line at the top of page 13.

The report of the committee on Dental Physiology was read by Dr. Ellis; to illustrate which a number of interesting experiments were made with the microscope and otherwise.

On motion, *Resolved*, That an order be drawn on the Treasurer, for the amount of the bill incurred by the publication committee in issuing the Transactions of the last annual meeting of this Association.

Dr. Atkinson read an Essay upon the question; "Has Dentistry attained to the dignity of a Professsion?"

On motion, *Resolved*, That a committee of three be appointed to prepare business for the nominating committee in reference to the standing committees,—the report to be made to-morrow morning.

Chairman appointed Drs. Benedict, Pease and Allen said committee.

The bill of the Corresponding Secretary was presented, and ordered to be paid.

Adjourned till 8 o'clock to-morrow morning.

THIRD DAY.

The Association met, according to adjournment; the President in the Chair. The minutes were read and approved.

On motion, *Resolved*, That the place for holding the next annual meeting be now selected.

Upon ballot, it was decided to hold the next annual meeting at Niagara Falls, on the last Tuesday of July, 1863.

The nominating committee was now called upon, and made the following report in regard to standing committees, to-wit:

1st. Committee of Arrangements—C. Dillingham and J. Taft.

2d. Committee on Publication—J. F. Johnston, J. Taft, Wm. A. Pease, B. Strickland, and W. D. Stone.

3d. Committee on Prize Essays—former committee continued—Drs. Hunt, Gildea, Clark, Rogers, and Suesserott.

4th. Committee on Dental Physiology—Wm. A. Pease, W. H. Atkinson, and P. G. C. Hunt.

5th. Dental Chemistry—Drs. George Watt, Geo. F. Barker, and W. M. Rogers.

6th. Dental Pathology and Surgery—former committee continued—Drs. Suesserott, Atkinson, Flagg, Hunt, and Allport.

7th. Mechanical Dentistry—H. R. Smith, H. Benedict, J. A. Watling, C. Palmer, and W. H. Allen.

8th. Dental Education—Geo. W. Ellis, H. A. Smith, and J. H. McQuillen.

9th. Dental Literature—J. H. McQuillen, J. F. Flagg, and W. W. Allport.

The report was accepted, and on motion, was adopted,—the nominations thereby being confirmed.

Dr. Atkinson then read a paper on Dental Pathology, in which were presented new and valuable ideas; it was referred to the committee on publication.

An Essay, by Dr. J. Foster Flagg, on the use of arsenic for devitalizing tooth pulp, was read by Dr. J. W. Ellis. It was an interesting and valuable paper, and elicited considerable discussion in which Drs. Stone, Pease, Ellis, Strickland and others participated. It was accepted and placed in the hands of the publication committee.

Adjourned till 2 o'clock P. M.

AFTERNOON SESSION.

Association met, acording to adjournment.

The vote upon the selection of place for the next meeting was reconsidered; and by a vote it was decided to hold the next meeting at Philadelphia, instead of Niagara Falls as agreed upon in a former resolution.

Dr. Flagg's paper on arsenic was now taken up and somewhat extensively discussed; as also that of Dr. Atkinson upon pathology.

On motion, *Resolved*, That a committee of three be appointed, to determine by actual experiment the correct answer to the question—"Do metals expand in the act of congelation?" and report to the next meeting of the Association. Committee—Drs. Watt, Pease, and Rogers.

The following instructions were given to the publication committee:

Resolved, That the committee of Publication be instructed as follows:

1st. They shall duly arrange and prepare the minutes, reports of standing committees, essays, etc., for publication.

2d. They shall secure the same to the Association, by copy right.

3d. They shall publish such edition of the same as shall be hereafter provided for.

4th. They shall furnish each member who has paid his annual dues a copy of the same.

5th. They shall duly notify the various local Dental Socie-

ties, through the periodicals or otherwise, in advance of such publication, that their members are entitled to receive each a copy of the proceedings thus published, by forwarding to the committee the sum of two dollars.

6th. Persons thus entitled may, by so ordering, receive bound, with such publication, the proceedings of the previous meetings of the Association.

7th. They shall employ a competent reporter, to furnish an accurate synopsis of the discussions of the next meeting, for publication.

8th. The funds in the treasury, and those forwarded by subscribers from local Societies as above provided for, shall afford a general guide to the committee, as to the expense they may incur in the fulfillment of these instructions.

In order to avail themselves of the advantages of these resolutions, it is requested of local Societies, that they report to the Publishing Committee the number and names of the members in good standing in their respective organizations.

On motion, *Resolved*, That a committee of two be appointed, whose duty it shall be to confer with members of the profession, upon the formation of local Societies. Committee—J. Taft for the West, and W. H. Atkinson for the East.

Miscellaneous business was now called for.

Dr. Stone asked—"What are the diseases of the teeth that produce neuralgia?" This was discussed at considerable length, by Drs. Atkinson, Watt, and others.

The query was also raised by Dr. Stone—"What is the best treatment for a fistulous opening through the cheek, to effect a cure without a contracted cicatrix?" Discussed by Drs. Atkinson and Stone.

On motion, *Resolved*, That four members be appointed to prepare Essays for the next meeting. The following were

appointed: Drs. H. A. Smith, G. W. Ellis, D. W. Stone, and W. H. Allen.

On motion, *Resolved*, That the thanks of this Association be tendered to the Faculty of the Cleveland Medical College, for the use of the lecture room for our occupancy during our convocation.

The Association now adjourned, to meet in Philadelphia on the last Tuesday of July, 1863, at 12 o'clock.

REPORT OF THE COMMITTEE ON DENTAL PHYSIOLOGY.

An Inquiry relative to the Distribution of Blood-vessels and Nerve Filaments to the tubuli of Human Dentine. Submitted by J. H McQuillen, D. D. S., Chairman of the Committee on Dental Physiology.

As the Constitution of the Association enjoins on the Committee of Dental Physiology, in presenting their yearly reports, to embrace in them, "if practicable, the results of original investigations," the following report is offered as containing the results of actual observation, on my part, in the direction specified during the past few years. In a disconnected manner some of the observations have appeared before, but they are here presented properly correlated, and a large portion is now submitted for the first time. All the experiments, some of which are original in their conception, and the rest in their application, have been performed over and again by me with uniform success.

It would be out of place here to dwell upon the importance of a thorough knowledge of anatomy, enlightened by physiology, in its application to dentistry; for it must be apparent to every one that rational practice can only be based on a correct knowledge of these sciences. Physiology, or that science which treats of the actions or functions peculiar to living organized beings during the continuance of health or

normal life, claims attention therefore, not as a branch of mere speculative knowledge, but as a science of immediate and vast practical utility. The first step towards the cure of disease is to find out what the disease is, and where it is located. Without a knowledge of the structure, offices and relations, which the various parts bear to each other in the animal economy, our search to determine what organ or function is deranged must be most vague and indefinite. To no organs in the body does this remark apply with more force than to the teeth.

There has been, as is well known, considerable diversity of opinion in the dental profession relative to the sensibility frequently experienced by patients, when the dentine is subjected to mechanical or chemical irritants; many practitioners regarding it as an exclusively pathological manifestation, and others as a physiological phenomenon, to a great degree. The views of some writers, carrying them so far as to induce them to denominate this condition *Inflamed Dentine* while others have been disposed to employ the term *Sensitive Dentine*, which if not more exact, is at least less exceptionable than the first. Now while it is a matter of considerable moment to determine the true nature of this subject, and although it does not come within the province of the duties of this committee to discuss pathological subjects, if such this really is, as has already been stated, a proper conception of diseased action can only be justly appreciated by a thorough consideration of the normal condition of the different tissues; to this end therefore an inquiry relative to the vascularity and sensibility of human dentine may throw some light upon the subject by ascertaining whether a careful examination of the tissue affords satisfactory evidence of the passage of capillary vessels and nerve filaments from the dental pulp, to the dentinal tubuli.

When a thin longitudinal section of an incisor, canine, or tooth of any other class is placed in the field of the microscope, innumerable capillary tubes are observed radiating

from the superficies of the pulp cavity; connecting these tubuli is an intervening granular structure, the intertubular tissue. After proceeding a short distance from the pulp cavity, without any change in their relations, the tubuli eventually divide, subdivide, and anastomose with each other, the latter condition being much more marked where the enamel and cementum are in contact with this tissue than at any other point.

It is asserted, by the highest authorities on this subject, that the largest tubuli (and these are not found in the crown, but in the fang near the apex,) are but the 1–10000 of an inch in diameter.

Having thus briefly described the appearances presented by dentine in the field of the microscope, it will be proper to consider the manner in which the circulation is carried on through the tissue. In the dentine of human teeth, the presence of blood vessels has not been satisfactorily demonstrated. And there is no occasion for them, as the tubuli and their anastomosing branches are all sufficient for the circulation of the liquor sanguinis. Although I have arrived at this conclusion as the result of careful investigation on my own part, it may not be amiss to present the evidence afforded by some of the most eminent microscopists on this point in substantiation of the position assumed.

Prof. Owen remarks: "The tubuli receive the plasma transuded from the vascular pulp, which circulates by anastomosing branches of the tubuli and by the plasmatic cells of the intertubular substance through the dentine, maintaining a sufficient though languid vitality of the tissue.

* * * * * * *

True 'dentine' has no canals large enough to admit capillary vessels with the red particles of blood."*

Tomes says: "At present, the dentinal tubes and cells and the pulp cavity have been alone described as existing in

* Owen on the Skeleton and Teeth, p. 231.

the dentine; but, in addition to these, we have, in many instances, canals for vessels traversing the tissue, just as we have the Haversian canals perforating bone. In the teeth of man, these vascular canals are never numerous and occur only in a few specimens. *I have seen eight or ten sections only in which the dentine is vascular."**

Kolliker remarks: "Dentine containing Haversian canals, the so-called '*vaso dentine*' of Owen, which exists in many animals, is rarely found in man, and I am only acquainted with one case, observed by Tomes (l. c. p. 225), in which the vascular canals were numerous; on the other hand, in the dentine with irregular tubuli, which is formed in obliteration of the pulp cavity, we occasionally meet with scattered Haversian canals and rounded cavities, like osseous lacunæ, constituting the so-called *osteo-dentine* of Owen.†

If no blood vessels pass into human dentine, it may be asked how can the tissue be nourished? The proper response to this query is that nutrition is invariably extra-vascular or outside of vessels, and that the *exosmosis* and *endosmosis* of the liquor sanguinis through the capillaries of the pulp, combined with the capillary attraction resident in the tubuli, is sufficient to effect all the results that could be accomplished by the presence of vessels.

A clear conception of the circulation of the liquor sanguinis in the dentinal tubuli may be more readily appreciated by a brief consideration of the manner in which, in the animal and vegetable kingdoms, by the circulation of nutritive fluids through a system of vessels or passages adapted to the purpose, the materials inservient to growth and renovation are conveyed to every portion of the organism of each, and at the same time the particles liberated by disintegration or waste of tissues are also removed.

No central organ to assist in the circulation of the sap is found in the vegetable; but microscopic observation has

* Tomes' Dental Surgery and Physiology, p. 49.

† Kolliker's Microscopical Anatomy, p. 474.

proved beyond a question of doubt, in particular classes of plants, the existence of a system of anastomosing vessels termed *laticaferous.* The fluid contained in these vessels can be seen in rapid motion, if a piece of the bark or the leaf of a milky plant be cut out and placed under the microscope. In the absence of the propulsive force of a heart, the circulation of the sap is attributed to the combined influence of *vis a tergo*, capillary attraction, the influence of light and air upon the leaves, and the affinity between the elaborated sap and the tissues of the plant.

The organs and canals by which, in the animal economy, the circulation of the blood is accomplished, constitute the vascular system.

Two distinct circulations—the greater and the lesser, or the systemic and pulmonic, with a heart for each—are presented in man and the higher animals. Though, for economy of space and material, the right and left heart are brought together so as to form apparently but one organ, and are spoken of as such; they are, after the embryonic period, entirely distinct and separate in their functions; one receiving and propelling the arterial, the other the venous, blood. From this organ as a common centre the two circulations arise and terminate, each system having its own set of arteries and veins connected at their peripheral extremities by the capillary vessels, the rhythmical motion of the heart being the chief impelling power of the circulation of the blood; superadded to this, however, the contractility of the muscular coats of the arteries, the capillary power resident in the fine tubes connecting these with the veins, and the *vis a tergo*, assisted by the *vis a fronte* or the suction power of the heart, in the latter are active forces.

The point at which the arteries terminate and the minute veins begin can not be exactly defined; for the transition is gradual; microscopic observation, however, proves that the minute arteries do not *terminate by open mouths*, as was formerly supposed, but that they communicate directly with

the veins by means of the capillaries. Unlike the arteries and veins, whose calibre diminishes in one direction, these vessels maintain throughout their entire course the same diameter. In the different textures of the body, however, the calibre of these vessels varies somewhat, the largest being found in the skin and medulla of the bones, and the smallest in the brain, and mucous membrane of the intestines, the average diameter being 1–3500 of an inch. Many physiologists formerly doubted the existence of membranous parietes in the capillary system; but the evidence presented in minutely injected specimens—in the web of the frog's foot, the tail of the tadpole, and young fishes—when placed under the microscope, along with the fact that fluids injected into the arteries pass directly into the veins, proves the incorrectness of that opinion. Schwann even claimed to have detected a muscular coat in these vessels.

The number of the capillaries, and the amount of space between them, determine in general the degree of vascularity of a part. Thus in the lungs, the network of capillaries is closer and the interspaces smaller than any other portion of the body. In the liver, the interspaces are of the same size, or even smaller than the vessels themselves; and in the kidneys the proportion of the latter to the former is as one to three. The brain, though receiving a very large quantity of blood, the capillaries are very small and less numerous than in some other parts, and the interspaces are therefore, comparatively speaking, large. In the periosteum, and especially the bones, the spaces are still greater. Lastly, human dentine and cartilage may be truly regarded as *non vascular* tissues, as no vessels pass into them.

As a general rule, the more active the functions of an organ are, the more vascular it is. Hence in all glandular organs, and in mucous membrane, the vessels are numerous and the interspaces small, while in periosteum and bone, the reverse condition is presented, and in dentine and cartilage,

where the organic changes that occur take place very slowly after they are once formed, vessels are entirely absent.

Strictly speaking, all tissues are *extra-vascular*, and the difference between *vascular* and *non-vascular* tissues is only one of degree, as the elementary structure is outside of the vessels in all parts alike. Thus, in bone, the capillaries do not penetrate beyond the Haversian canal; in the tooth, the parietes of the pulp cavity and the superficies of the root; in muscle, the sheath of the ultimate fibre; and in the nervous tissue, the membrane investing the tubes.

As the capillary vessels have distinct parietes, it follows as a necessary sequence that the liquor sanguinis, in which the materials inservient to the nutrition of these tissues are suspended, can only escape by *transuding through* their walls. The fallacy of the hypothesis that vessels terminate by open mouths has already been alluded to; and it may be added that the existence of such an arrangement is unnecessary in the explanation of the function of nutrition, as all that each tissue requires of the vessels is, that the blood should be brought so near to the active elements of the tissues that some of its fluid part may be absorbed or imbibed by them—and the distance through which such imbibition is effected is not always small. In bone, for example, where we have found the vessels quite far apart, the substance which is farthest removed must be nourished by imbibing fluids through the space between them; the lacunæ and canaliculi connecting with each other, and with the Haversian canals, facilitate the operation of nutrition as an *extra-vascular* action. The most satisfactory explanation of the capillary circulation is that advanced by Prof. Draper, of which the following is a brief summary:—

"Experiments on inorganic bodies show that if two liquids communicate with each other through a capillary tube, for the walls of which both have an affinity, this affinity being stronger in the one liquid than in the other, a movement will ensue; the liquid which has the greater affinity being ab-

sorbed most energetically into the tube, and driving the other before it. Now this is precisely what seems to take place in an organized tissue that is penetrated by a fluid, between whose particles and those of the tissues which it penetrates, affinities exist. These affinities are continually being newly developed by the acts of growth, as fast as those which previously existed are satisfied or neutralized by the changes that have already occurred; and thus, in the circulation of the nutritive fluid there is a constant attraction of its particles toward the walls of the vessels, and a continual series of changes produced in the fluid as the result of that attraction. The fluid which has given up to a certain tissue some of its materials no longer has the same attraction for that tissue; it is, consequently, driven from it by the superior attraction then possessed by the tissue for another portion of the fluid which is ready to undergo the same changes, to be in its turn rejected for a fresh supply. Thus in a growing part there must be a constantly renewed attraction for that portion of the nutritive fluid which has not yet traversed it; while on the other hand there is a diminished attraction for that which has yielded up the nutritive materials required by the particular tissues of the part, and thus the former is continually driving the latter before it. But the fluid which is repelled from one part may be still attracted toward another, because that portion of its contents which the latter requires may not have been removed from it. In this manner the current is maintained throughout the whole capillary network, until the blood is entirely exhausted of its nutritive matter."

Those tissues which receive no vessels into their own substance, and are nourished therefore by the fluids absorbed from the vessels of an adjacent vascular part, are the instances in which imbibition is effected through the greater distance. Thus, the articular cartilage derives its nourishment from the subjacent bone, the cementum, from the vessels of the periodental membrane, and the dentine from those of the pulp.

Even after the extirpation of the pulp, as long as the

periodental membrane retains a normal condition, the nutrition of the fangs is maintained by the blood circulating in the capillary vessels of that tissue. Though it may be regarded a matter of question by some, whether the *liquor sanguinis* nourishes the *dentine* as well as the cementum; from the fact that nutrition is invariably *extra-vascular*, and on account of the anastomoses between the dentinal tubuli and the lacunæ and canaliculi of the cementum, it is fair to presume that such is the case.

In endosmotic and exosmotic action, fluids pass with equal facility from without to within, and within to without, or, in other words, either imbibition or transudation or both may take place. This property of permeability by fluids, possessed by all tissues, *dead* as well as *living*, depends upon their invisible porosity.

Those who look upon absorption as a purely *vital operation*, and regard dentine, when deprived of the pulp, as completely devitalized, may assert that a fluid can not penetrate a dead tissue. But this is not true, as the phenomenon of absorption is not a *vital* but a *physical act;* as imbibition takes place in *dead* tissues, though more slowly than in the same parts when living; and this difference of rate is readily accounted for by the active circulation in the latter, and the stagnant condition of the fluids of the former.

That this is a purely *physical* property of tissues can be readily proved by four experiments — first suggested by Dutrochet. They are as follows:

No. 1. Tie a piece of moist bladder over a tumbler completely filled with pure water, so that it comes in contact with the surface of the water; then scatter some salt over the outer surface of the bladder. This soon dissolves by the water that passes from the tumbler through the pores of the tissue; a counter current is then established, the solution above passing through the tissue and mixing with the water below, and that which in the beginning was perfectly pure water acquires a decidedly saline taste.

No 2. Place the intestine of a chicken, containing a certain quantity of milk, in another tumbler of pure water, and in a few hours the water acquires quite a milky appearance, and the intestine, at first but partly filled with milk, materially increases its contents, proving that milk *transudes* through the tissue and water is imbibed by it.

No. 3. Take a solution of *salt* and *water* and pour it into a glass tube, the lower extremity of which is bell shaped and covered with a piece of bladder; then immerse the lower extremity of this instrument—named by Dutrochet an *endosmometer*—in a tumbler of pure water, and after a short period, by the constant infiltration of the water through the membrane into the instrument, the solution gradually ascends the tube.

No. 4. Selecting a second instrument similar to the one described above, place in it *pure water*, and dip the closed extremity in a tumbler containing a *saline solution*. In this instance the water in the instrument, instead of ascending, descends, owing to the rapidity with which the water passes through the membrane to mix with the solution in the tumbler. In each of these instances there are two currents, the water passing in one direction and the solution in the other; the rarer fluid passing more rapidly than the denser one.

To these two currents Dutrochet gives the names *endosmosis*, (from without to within) and *exosmosis* (from within to without) supposing at first that the energy of the action was due to electricity, but he eventually abandoned that position.

The most satisfactory explanation of these phenomena, so distinctly manifested in these experiments, is that which regards the invisible pores of the membrane employed as a system of capillary tubes exerting attraction on the fluids passing through them, to mix with each other.

If one of the fluids be more strongly attracted by the tissue than the other, it will, of course, be longer in its passage through the pores; and while the level of the fluid which

passes through more quickly will necessarily fall in the vessel that contains it, that of the slowly traversing one will rise until the increasing pressure of the rising column of water counterbalances the effect of the more powerful attraction.

In addition to this there is a tendency which substances have to diffuse themselves uniformly in the fluids in which they are dissolved. Any matter, in solution, therefore, which comes in contact with the membrane, will tend to diffuse itself in the fluids of the pores, and with the fluids in contact with the opposite side of the tissue, until the distribution of the substance dissolved is uniform in the two liquids which the membrane separates. *Imbibition* and *transudation*, or *endosmosis* and *exosmosis*, for they are convertible terms, are dependent, therefore, upon the *penetrativeness* of the *liquids*, the penetrability of the membrane, and the affinity of the liquids for miscibility with each other.

It is owing to this physical property in the capillary vessels, combined with the elective or vital affinity exerted by the tissues upon the plasma of the blood, that nutrition occurs as an *extra vascular* action. The liquor sanguinis that is to nourish a given tissue passes out as an exosmotic current, and after it has yielded up all the material it held in solution, returns through the parietes of the vessels as an endosmotic current.

No organized tissue, however dense it may be, is an exception to the operations of this process.

As evidence of this, on placing a very thin and *dry* section of a tooth, (in which the dentine and cementum perfect, under the microscope, the anastomosis between the tubuli and the lacunæ and canaliculi, will not only be observable, but also the passage of fluids along the courses of the dentinal tubes, when a drop of liquid is brought in contact with the section.

Again, on removing the pulps from a number of recently extracted teeth and weighing the latter they will be found to

lose from 1–7 to 1–8, according to Tomes, of the weight by drying.

I have also tested this matter in the following manner. A tooth weighing when dry 24 grs. was placed in water and allowed to remain 19 hours. At the expiration of that time the moisture was removed from the external surface and from parietes of the pulp cavity and the tooth again weighed, when it was found to have gained exactly 3 grs. or in other words $\frac{1}{8}$ of its original weight.

As further evidence a number of dry teeth, with openings leading from the crown to the pulp cavity large enough to afford a fair view of the same, was selected and the pulp cavity of each tooth hermetically sealed by closing up the orifice in the crown and the foramina at the apices of the fangs with white wax or some other substance impervious to water. After performing this in the most careful and exact manner on placing them in water in a short period of time varying from a few hours to a day or two, according to the relative density of the teeth, the pulp cavity of each tooth, which in the beginning was perfectly dry, was found to contain more or less water. This water, of course, could only have entered by means of the anastomoses existing between the *locunae* and *canaliculi* of the *cementum* and *dentinal tubuli* of the dentine.

It may be asserted that the water, found in the pulp cavities and supposed to have been imbibed through the microscopical openings in the dental tissues, might have passed between the wax and walls of the cavities of decay; to ascertain the *truth* on this point the mouth of a small glass phial was closed with wax in the same manner that the teeth had been, the phial was then placed in water and allowed to remain there as many hours as the teeth, or twice as long if desired. On removing the phial from the water, the *interior invariably has been found perfectly dry.* Taking into consideration the impermeability of glass, if any water should be found there it would be proof positive that it had passed between the

wax and the mouth of the phial; failing to do so its absence is the strongest negative evidence that can be adduced to prove that the water does not enter the pulp cavities by passing between the wax and the walls of the cavities of decay in the teeth experimented upon, but is unquestionably carried on by capillary attraction, exerted through (to the naked eye) the invisible pores of the cementum and dentine.

To recapitulate. The circulation of fluids in the vegetable kingdom; the fact that nutrition is invariably *extra vascular*, and that the fluids which nourish the tissues can only escape by transuding through the parietes of the capillary vessels; the phenomena of endosmosis and exosmosis, manifested alike in dead as well as living tissues, due to their *invisible porosity;* the universal operation of this law in all organic structures; the fact that the porous character of the cementum and dentine, though invisible to the naked eye, is readily demonstrated under the field of the microscope; the loss of weight on drying teeth recently extracted; the increase of weight on placing dry teeth in water; the presence of water in the pulp cavities of the teeth experimented upon; the absence of it in the phial, are one and all so many strong and conclusive arguments in support of the permeability of dental tissues.

The facts and reasonings which have been presented, it appears to me, justify the assertion that human dentine is not supplied with blood vessels, and that the tubuli opening as they do upon the walls of the pulp cavity, their contiguity to each other, combined with their division, subdivision, and anastomoses, and the capillary attraction resident in those tubes afford the most admirable arrangement that it is possible to imagine for the circulation of the liquor sanguinis in every portion of the structure. Indeed, under such circumstances it would have been a work of supererogation to have placed vessels there.

If Miller's definition, therefore, be accepted as a satisfactory one, that "inflammation, the source of much evil, medi-

cal as well as surgical may be defined, an alteration in the healthy structure and function of a part, accompanied by a perverted condition of the blood and capillary blood vessels; ordinarily attended with redness, pain, heat, and swelling," it must follow as a necessary sequence, that dentine, being unsupplied with blood vessels, is incapable of becoming inflamed and therefore that it is a decided misnomer to apply such a term to any abnormal condition of that tissue.

Having fairly disproved the presence of blood vessels in the tubuli of human dentine, it remains to consider whether satisfactory evidence has been afforded that nervous filaments are distributed to them from the dentinal pulp, for as all are aware three hypotheses, based upon physiological considerations, have been advanced in the endeavor to solve that puzzling and trying subject *sensibility* of *dentine.*

The first of these theories based upon the supposition that nerve filaments pass from the pulp into the tubuli and eventually form a delicate plexus under the enamel accounts for the sensations experienced by inferring that impressions are made directly on the plexus under the enamel, or the terminal extremities of the filaments and from thence they are transmitted to the pulp; the second attributes the sensation to *vibration* or the conduction of the shock of an operation through the *solid* dentine of the pulp; the third to pressure made by an instrument upon the liquor sanguinis in the tubuli when excavating a curious cavity or when tooth-edge follows the introduction of sweets or acids in the mouth, that it is due to the union of these substances with the same fluid.

The first named theory has recently received an *apparent* confirmation in the assertion on the part of Mr Tomes that he had discovered such filaments in the dentinal tubuli in the field of the microscope. That he may not be misrepresented it will be proper to present in his own language the description of his investigations. Prior to doing that however it

may not be amiss to quote what Prof. Owen had placed on record years before. He says:

"The delicate nerve branches on the pulp's surface, some minute productions of which *may* penetrate the tubuli, convey sensations of impressions affecting the dentine—sensations of which every one has experienced the acuteness when decay has affected the dentine, or when mechanical or chemical stimuli have 'set the tooth on edge.' "*

In another part of the same work he remarks:

"I had the tusk and pulp of the great elephant at the Zoological Gardens longitudinally divided, soon after the death of that animal in the summer of 1847. Although the pulp could be easily detached from the inner surface of the pulp-cavity, it was not without a certain resistance, and when the edges of the coadapted pulp and tooth were examined by a strong lens, the filamentary processes from the outer surface of the pulp could be seen stretching as they were withdrawn from the dentinal tubes before they broke. They are so minute that, to the naked eye, the detached surface of the pulp seems to be entire, and Cavier was thus deceived in concluding that there was no organic connection between the pulp and the ivory."†

The following are Mr. Tomes' statements:

"With proper care in manipulating, nothing is more easy than to demonstrate the existence of the dentinal fibrils in any tooth which has been recently extracted. If a thin section be made in a plane, parallel with the direction of the tubes, and then placed in dilute hydrochloric acid until the whole or greater portion of the lime is removed, and the section be afterwards torn in a direction transverse to the tubes, many of the fibrils will be found projecting from the torn edge. * * * "If a section be taken in which the tubes are extended into the enamel, and submitted to the action of

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*Owen on the Skeleton and Teeth, 1854, P. 232.

Owen on the Skeleton and Teeth, P. 277.

acid, it will be found that after the latter tissue has been dissolved fibrils will remain connected with the dentine at those points where the tubes penetrated the subjacent tissue. It is not necessary, however, to decalcify in order to show the fibrils. If a similar section to that already described be divided, with the edge of a knife, many of these organs will be seen. * * * "In order to demonstrate the connection of the fibrils with the pulp, fine sections should be made with a sharp knife, from the edge of the pulp cavity. * * * "That the fibrils proceed from the pulp may be seen by carefully fracturing a fresh tooth with as little displacement of the fractured parts as possible, and then, by slowly removing the pulp from its place in the tooth, we shall be enabled to examine the fibrils which have been drawn out from the tubes. By this procedure some of the fibrils will be withdrawn from their normal position in the dentine, in the greater part of their length, a few of them retaining short lengths of their branches, but sufficiently long to show that they have come from the branches of the dentinal tubes."*

In offering the preceding statements, my desire to afford Mr. Tomes every advantage that a fair rendition of his descriptions demands, and in addition to this all the advantage that can be obtained from the *supposition* advanced relative to human dentine, and the *results* obtained in the examination of the elephant's tusk on the part of Prof. Owen. For, although some time has elapsed since the publication of Mr. Tomes' description, no published confirmation of them has come under my notice, based upon actual observations on the part of other microscopists, with the exception of that of Dr. Lionel S. Beale, notwithstanding the fact that several works and monographs, in which the introduction of such an important discovery would be proper, have appeared during that period.

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* Tomes' Dental Surgery, p. 327.

In a summary of Dr. Beale's observation, which was first published in England* and eventually republished in this country†, it is stated that, "Mr. Tomes has shown that the dentinal tubes are occupied with a soft, solid structure, which may be seen projecting in the form of solid processes from the broken ends of the dentinal tubes. The truth of these observations has, however, been doubted by several observers. Dr. Beale has been able to verify Mr. Tomes' statements as to the dentinal tubes being occupied by this soft structure, and sent round a preparation in which this material had been colored red with carmine, and was most clearly demonstrated. "The dentinal 'tubes' of a *living tooth*," Dr. Beale says, "are never empty; indeed they are not tubes, nor are they canals for the transmission of nutrient substances dissolved in fluid, but they contain a soft, solid substance, the central portion of which is in a state of active vitality."

Mr. Gray, the celebrated English anatomist, in his recent work, alludes to the nerve fibrils, but he merely gives Mr. Tomes as authority. He says: "The dental tubuli have comparatively thick walls, and contain, according to Mr. Tomes, slender cylindrical prologations of the pulp tissue."‡

Prof. Leidy, one of the most eminent microscopists in the world, and who has paid as much attention to the microscopy of the teeth as any other observer of the present day, and takes a great deal of interest in such investigations, makes no allusion to the nerve filaments in his work, although two years later in its issue than Gray.

His statement is: "The walls of the tubules are nearly as thick as their calibre, which, in the fresh tooth, is filled with a colorless liquid, replaced by air in dried specimens." §

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* Quarterly Journal of Microscopical Science, January, 1862.

† Dental Cosmos—Periscope of Medical and General Science in their relations to Dentistry, April, 1862.

‡ Gray's Anatomy, p. 587, 1859.

§ Leidy's Human Anatomy, p. 290.

From the foregoing it is fair to infer that either no effort has been made on the part of others to determine the accuracy of this position, or, in doing so, they have been unable to secure the same results, and have made no allusion to the fact. Be that as it may, so far as others are concerned. Speaking for myself, I can truly say, that after giving the subject the most careful attention, I am unable to support the position. Arriving at such a result, after having favored for years the hypothesis that nerve filaments pass into the dentinal tubuli, it will be perceived that the conclusion reached has not been in support of a preconceived opinion on my part, but in opposition to it. In confirmation of this I would direct attention to the following quotations, the former* from a paper published by me several years ago, and the latter† from my review of Mr. Tomes' work, when first presented to the profession. In the first I remark:

"The sensation perceived in the dentine is, no doubt, due to impressions made upon the nervous filaments, ramifying through the tubuli, and the plexus, which is found directly under the enamel, offers such an extended surface of nerve substance as to render that the most sensitive point. The disappearance of the sensibility, after this part is removed, has been accounted for by supposing that the nervous current is destroyed by the section of the filaments."

In the latter: "This discovery—the nerve fibres in the dentinal tubuli—is one of great importance, as it confirms the theory entertained by many for years, that the sensibility of dentine is due to impression upon the nervous filaments in the tubes."

Since the appearance of Mr. Tomes' work, from time to time, I have, over and again, endeavored to discover in the field of the microscope the fibrils described by him as present in the dentinal tubuli and projecting from the dental pulp.

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* Sensitive Dentine, Dental News, p. 91, Vol. X, 1856.

Dental Cosmos, p. 487, Vol. I, 1860.

In these investigations not only have human teeth been subjected to the test, but also the incisors of the calf have been used in this way repeatedly.

In the experiments on human teeth I have rarely found the strong adhesion existing between the pulp and the dentine described by Mr. Tomes; on the contrary, with little or no effort, they could be readily separated. Again, if fibres passed from the pulp into the dentinal tubuli it appears fair to presume that under such circumstances it would be almost an impossibility to execute an operation of daily performance in the practice of dentistry, viz., the removal of exposed pulps from decayed teeth, in the mouth of patients; for, under such circumstances, the pulp would be as adherent to the dentine, as the periosteum is to bone or cementum, and as difficult to remove; and yet every one is aware that with proper manipulation, the pulp can be readily removed in its entire length.

In examining the teeth of the calf the following course was pursued. Fresh calves heads were procured, the incisors extracted and the latter cut longitudinally with a fine saw. On each occasion the pulp was readily lifted from the pulp cavity, with the tenaculum, no more effort being required than would be demanded in removing a ripe chestnut from the burr after opening the latter. No other connection appeared to exist between the pulp and the dentine than that of simple apposition, except at the edge of the large foramina at the extremity of the fangs. Here the adherence was so strong that it required considerable force to detach it, but no fibres were persceptible under the microscope either passing to the dentinal tubuli from the pulp, or projecting from the latter after it had been removed from the tooth, although the most careful search was made for them.

While no nerve filaments were perceptible, the most beautiful capillary anastomosis was observable in the pulp, on different occasions, with even a lens of a low power; the anas-

tomosing vessels being as distinct and presenting every appearance of injected specimens.

While thus unable to confirm, by my experiments, Mr. Tomes' statements, I do not wish to be understood as asserting that he never saw what he describes. On the contrary, granting the accuracy of his observations, it is not difficult to account for them.

Some time since a writer, whose name I can not recall, suggested that the fibres described by Mr. Tomes were nothing more nor less than coagulated albumen of the blood. Now, while it is true that albumen exists in a fluid state in the liquor sanguinis and may be readily made to pass from the fluid to the solid state, or to coagulate by the influence of certain reagents it has no *spontaneous* tendency to assume that condition. If a solution of albumen in the serum of the blood be exposed to a heat between 140° and 150° it coagulates and then becomes insoluble in water. By evaporating white of eggs at a temperature not exceeding 120°, coagulation takes place, or solid albumen is formed, and the mineral acids also have the property of producing the same result.

While, therefore, this suggestion will not account for the phenomenon, the coagulation of the fibrine in the liquor sanguinis, circulating in the dentinal tubuli, may; for fibrine, which forms the basis of the muscles as a proximate principle, exists in a state of solution in the blood, forming, with the water present, the liquor sanguinis, in which the *red* and *white corpuscules* float, this fibrine is distinguished from every other proximate principle by its remarkable property of *spontaneous coagulation.* The phenomenon of the coagulation of the blood is one which every body has witnessed. Thus when blood drawn from a vein is allowed to rest, it speedily separates into a solid portion, or *crassamentum*, or *clot*, and a fluid portion, the *serum;* the former, consisting of *fibrine* with the red corpuscules entangled in it.

Pure fibrine is white, tasteless and inodorous; it tears into

thin laminæ, which are remarkably elastic and tough. It can be readily obtained by filtering frogs' blood, the red globules being too large to permeate the pores of the filter. The liquor sanguinis passes through in a colorless state, and the fibrine coagulates, free from coloring matter.

Another way to obtain fibrine, and the course most satisfactory for sustaining this theory, is to stir briskly, with a bundle of twigs, blood as it flows from a vein, or the blood passed rapidly from the body of a frog into a vessel. Under such circumstances the fibrine coagulates on the twigs, in delicate shreds, and on these being washed, colorless fibrine is again obtained.

In the previous part of this paper, the passage of the liquor sanguinis through the walls of the capillaries by the act of transudation into the dentinal tubuli, for the purpose of nourishing the dentine, has been fully dwelt upon, and, it is trusted, fairly proved by the most unanswerable facts and arguments. Satisfied that this is the case, it appears to me more than probable that the fibres described by Mr. Tomes are nothing more nor less than *coagulated fibrine*, which, in contradiction to albumen, is capable of spontaneous coagulation.

The query may be advanced—If there are no nerve filaments distributed to dentine, how is it possible to account for the acute sensibility experienced by some persons when mechanical irritants are brought in contact with that tissue? The proper response to this is that while *sensation*, *general* and *special*, is a peculiar endowment of the animal kingdom, *nerves are not the originators of sensation*, *but the conductors of it to the sensorium*, and for the production of sensation or sensibility, it is not necessary that the impression should be made directly on the terminal filament of a nerve. All that is demanded in sensation, *general* or *special*, is that an impression should be made on a medium capable of conducting it to the nerve, through which it may be conveyed to the brain. Thus, in audition, when, by the ringing of a bell, or

by some other means, the air is thrown into vibrations, the air, acting as a *conductor*, conveys the impression to the membrana tympani, which communicates it to the ossicles of the ear; from thence it passes to the fluids of the internal ear and the impression, then reaching the auditory nerve, is eventually conveyed to the brain. Again, in the sense of touch, which, though classified as a *special sense*, is nothing more than an active or exalted condition of *general sensation*, impressions are not made directly on the terminal filaments, but the thing *touched* comes in contact with the skin, a tissue devoid of sensation, and this intervening tissue, acting as a conducting medium, modifies the impression to such an extent that a correct appreciation of the thing felt is secured. Let the cuticle be removed and then the function of the nerve is destroyed for the time, and exquisite sensibility or pain is substituted.

Applying these principles to dentine, it can hardly be regarded as assuming too much to say that that tissue is merely a *conductor* of impressions to the highly vascular and sensitive pulp, and that the impressions there received are conveyed to the brain, by the delicate nerve filaments which constitute a large part of the pulp. The nerves, of which these fibres are the terminal filaments, belonging, as they do, to the third pair or *great sympathetic*, are *peculiarly sensitive* and capable of conveying the slightest possible impression to the sensorium. Therefore, in all operations on vital teeth, whether for *stolid* and insensible persons, so called, or for the *nervous* and exquisitely *sensitive*, impressions are invariably conveyed by the dentine to the pulp, and from there to the great center of the brain, varying, however, in effect, according to the impressibility or susceptibility of the patient. The molecules of *organic* and *inorganic* matter which enter into the composition of dentine are as liable to be thrown into vibrations as any analagous structure, and when an instrument is brought in contact with the tissue for the purpose of excavation, it is reasonable to infer that an impression made

on one molecule is communicated to an adjoining one, and from that on until it eventually reaches the pulp. The presence of the liquor sanguinis in the tubuli more than probably assists in a marked degree in conducting these vibrations.

Granting this position to be correct, it becomes an interesting point to determine why the same cause should be attended by such opposite results in different individuals, and in the same individual at different periods. There can be little or no question that much of this difference in persons, relative to the pain attendent upon operations on the teeth, is due to temperament. Some feel, see, hear and think more keenly and quickly than others, and in this, justly named the nervous temperament, as slight cause of irratation, such as the excavation of decay from a tooth, which would make little or no impression on one differently constituted, becomes a source of most exquisite suffering ; superadded to and in keeping with this general susceptibility on the part of the patient, there is an accompanying impressibility on the part of the highly vascular and sensitive pulp. In accounting for the fact that persons who, as a general thing, suffer very little from dental operations, some times experience a great deal of pain, I would say, while unable, with the facts that have been presented, to recognize the possibility of inflammation occurring in dentine, as all organized structures are liable to take on diseased action, it is possible that ths molecules of dentine, under such circumstances, may conduct impressions more readily and perfectly than at any other time, and, combined with this, no doubt there is an increased susceptibility on the part of the pulp and nervous system generally. Recognizing, therefore, that under some circumstances the ordinary sensibility of the dentine, naturally more acute in some than others, may be very much increased by pathylogical influences, I am inclined to believe that *sensitive dentine*, so called, is mainly and generally a physiological phenomenon.

In conclusion, gentlemen, regretting my inability to be with you to read this communication, and to corroborate the assertions contained in it by the series of experiments described, I regard myself as peculiarly fortunate in being able to intrust the presentation of the paper and the performance of the experiments, to such an able and intelligent gentleman as my friend Dr. G. W. Ellis, who has placed me under great obligations by promising to take charge of the entire matter.

COMMUNICATED TO THE AMERICAN DENTAL ASSOCIATION.

BY J. FOSTER FLAGG, D. D. S.

Arsenious Acid as a devitalizer of the Dental Pulp.

Among the various agents which dentistry has selected from the pharmacopœia to aid in the alleviation of human suffering, and the furtherance of its usefulness as a profession, no one, I think, will rank as of more importance than arsenious acid, the action and use of which forms the subject matter of this communication.

It is not my intention to present any thing historical in relation to this sheet-anchor of conservative dental operating, but I can not forego the pleasure which this opportunity affords me to again connect the name of Dr. John R. Spooner, of Montreal, with the introduction of this remedy into the practice of our specialty, feeling as I do that on all meet occasions credit and thanks should be awarded him.

It is now more than twenty-five years since the capability of ars. acid for destroying the vitality of the tooth pulp, without injury to the tooth substance, has been demonstrated, and yet reference to dental text books and conversation with dental practitioners exposes a diversity of opinion in regard to its use, abuse, power and even mode of action that seems

to intimate a singular deficiency of even so much positive information as a few years of investigation would give any earnest seeker after truth. For the past six years I have been engaged in careful, watchful, experimental research in this direction, and I have hesitated until now to give such results as have accrued, mainly from the fact that quite promptly the indications I obtained pointed out many received doctrines in relation to arsenial applications as fallacious; all fears as to untoward results, groundless except as the fruit of a degree of clumsiness in manipulation and ignorance of dental science amounting to culpability; all directions, as to limit of duration of application, based upon a want of knowledge rather than that erudition which alone entitles one to the grade of teacher, and the promised satisfaction to operators and patients, oftentimes impossible of realization, is contradicted by the evidence of the senses of the former and the cries of suffering and universal dread of the operation of "extirpation" by the latter.

These considerations seemed sufficient to make me hesitate in giving publicity to views that so antagonized with those apparently established; but years have not only been confirmatory but cumulative in their testimony, and I feel that it is now a duty that I should present what I believe, trusting implicitly in the stability of the position that truth will maintain itself against all assailants, and that what are thought to be facts, and are not so, will be eventually shattered by their own worthlessness.

The mode of operation by which ars. acid accomplishes its results is as unsettled to the mind of science now as ever it was, the theories in this matter having each enrolled as their champions gentlemen of unquestioned attainments whose experiments, instead of clearing the pathway for the followers, have cumbered it with opinions and *assertions* so diametrically antagonistic as to leave "confusion worse confounded." But not alone with these difficulties has dentistry to contend, for to us there is proposed a problem upon

which from *anatomical* considerations the conflicting experiences of Leibig and Herepath, the disagreements of Wood and Stille shed but little light; for the pulp of a tooth has scarcely more resemblance to the human economy than it has to the "glairy albumen of eggs!" The questions then for dentists, are: How does ars. acid devitalize the pulp? What length of time is ordinarily required to effect this? What are the indications of its progress and the sign of its completion? What are its sequences? If the web of a frog's foot be placed under the microscope, and an application of dry arsenious acid made to it, one will observe in the course of an hour or an hour and an half a very perceptible increase of capillary circulation; a decided "determination" of blood to the part takes place, followed in due time by that condition known as "congestion," in which complete stagnation of the corpuscles announces, that unless relief is afforded, true inflammatory condition will supervene; at the expiration of from four to six hours, the intense redness, the swelling of the parts, and the manifest indications of pain, inform us of the presence of that abnormal state which must terminate in one of two ways, viz.: Restoration to health by "resolution," or suppuration and death of the part; at this juncture if the arsenious acid be removed, and anti-phlogistic treatment be resorted to in the shape of cold applications and rest, the parts will return to a normal condition and the health of the animal be, for months after, to all appearances unimpaired; ars. acid is therefore at least a vital irritant, and as such affects the circulation; and it is farther proven that up to this stage of diseased action no combination which ultimately causes "molecular death" takes place, any more than follows the exhibition of other vital irritants, such as cantharides, mustard, etc. Ars. acid is, however, a very powerful irritant when the opportunity for its exhibition through the medium of the circulation is afforded.

The amount of this substance which is usually employed for the devitalization of a dental pulp is about the 1–25th of

a grain. This quantity mixed with the same weight of acetate of morphia, and made into a thick paste with creosote, was applied upon the web of one of the hind feet of an ordinary sized frog, just at the junction of two of the toes, and fixed securely by a carefully but not tightly applied bandage. In about six hours the animal gave evident signs of indisposition; at the twelfth hour it was perfectly helpless, with occasional twitching, which continued until the eighteenth hour, after which it remained with scarcely perceptible vitality till the twenty-fourth hour, when it died. Made usual application of ars. acid and creosote (without acetate of morphia) to same sized frog in same manner; same signs as before with the difference that death supervened in nineteen hours; action more prompt. Made usual application of ars. acid and creosote to frog weighing 5½ oz., death ensued in four days and twenty hours.

Made usual application of ars. acid and creosote to frog weighing 7¼ oz., death ensued in four and a half days.

Made usual application of ars. acid and creosote to frog weighing 9 oz.; death ensued in *four days*.

It is therefore demonstrated that a given amount of ars. acid will, through the medium of the circulation, induce its peculiar action in sufficient force to destroy vitality in an animal more than 100,000 times its own weight!

By the employment of Reinch's test I obtained results which indicated the presence of ars. acid in quantity according to the following order: 1st. In the liver. 2d. In the stomach and intestines. 3d. On the cotton upon which the application was made. 4th. In the heart. 5th. In the muscular tissue of leg to which application was made. 6th. In the muscular tissue of the other hind leg, that having been chosen as the part most remote by the route of circulation from the point of application.

The frog which weighed 5½ oz. was chosen for this examination in order that the larger ones should be reserved to test the antiseptic power of arsenious acid. The four others,

ranging from two to nine ounces in weight, were kept in a warm room, and though putrescence was still more favored by laying them in contact with each other, *not the slightest change in this direction occurred;* thus showing that 1–25th of a grain would not only destroy vitality in the relatively enormous amount of tissue above mentioned, but having done so, would preserve the tissue devitalized from decomposition. I wish, at this point, to direct attention to what formerly seemed to me very singular, and requiring some lucid explanation, viz.: the fact, on the one hand, that 1–25th of a grain of ars. acid would produce death of from 10,000 to 100,000 times its own weight of tissue in from twenty-four to one hundred hours, and that so small an organ as the dental pulp should require, according to the testimony of different writers, from twelve to forty-eight hours duration of application of the same quantity; and then, "if, on the removal of the arsenic the part be still sensitive, the renewal of the application" should be "the practice mostly advocated," or why it should ever be necessary "after the lapse of thirty-six hours" to remove the cotton wool and ascertain "the effects of the application?" The "effects," it would seem, *ought* to be, by that time, the death of the entire superior maxilla and all it contained! and yet the testimony of patient after patient is, that even then vitality, accompanied by *exalted* sensibility, exists, particularly in those portions of pulp contained in the buccal fangs of superior molars and the anterior fangs of inferior molars. Further, I found upon removing applications that actual experiment showed the presence of all the ars. acid (practically) which had been placed upon the cotton when it was introduced. Then came the question, Why should *another* application be requisite? and experiment soon proved that it was not so, for the same cotton applied to the part still sensitive produced the desired result just as promptly. Again the question, why should this application, deep seated, do what seemed impossible for it to accomplish from its external position? Clearly, because the

intervening dead tissue prevented its action upon the living structure. How long would this act as a preventive? Experiment proved that it would do so until sufficient time had elapsed to render it doubtful as to whether the final result was due to the influence of the arsenial application, or was merely the natural sequence of the septic influence exercised by the contiguity of dead pulp. Observation has led me to adopt the opinion that it is the effect of combined influences, for I have had sufficient proof that the presence of ars. acid in the structure of the pulp (though experiment shows its amount at best to be almost incomprehensibly minute) is productive of devitalization in a much shorter space of time than would be required by that degree of irritation which would be induced by the presence of dead matter alone. It has therefore seemed to me to be a matter of moment that the most ars. acid possible should enter into the pulp structure, be that *most* ever so little! and that this result may be obtained understandingly it becomes necessary to inquire first,—How is arsenious acid introduced into the pulp tissue? I answer, through the medium of the circulation. What is the effect of an arsenical application upon a pulp? First; Determination of blood, occasioning the uneasiness and throbbing of which patients generally speak about fifteen or twenty minutes after the application has been introduced.

Second; Congestion, occasioning the cessation of throbbing and the feeling of dull "growling" knowledge of the presence of the tooth. Third, Inflammation and death of that portion of the pulp nearest to the application; and here we, as dentists, must take cognizance of the anatomy relating to the organ we are treating, for another cause of irritation, purely mechanical, has by this time commenced taking a part more or less active according to the development of the tooth, and the temperament of the patient. It must be remembered that the dental pulp is surrounded by unyielding walls; that the cavity in which it is located is comparatively quite large and bulbous in the centre of the tooth, and that

the apicial foramen is almost always exceedingly minute before any exposure of the pulp is liable to occur as the result of caries; with this reflection it will be seen how promptly increased circulation would lead to strangulation, preventing first the egress and secondly the ingress of blood, and thereby stopping all functional action. Congestion, we know, does this, and here then is the solution of two results, viz.: the absence of pain during the remaining process of devitalization, and the cessation of further introduction of ars. acid into the body of the pulp. The latter of these deductions having been arrived at theoretically it remained that it be proven by experiment, for though some good practice is difficult to reconcile with acknowledged theories, no theory can stand which is not demonstrable in a fair proportion of cases.

It is now several years since I began to doubt the truth of the "inflammatory and tooth destroying" results of arsenious treatment attributable to "duration of application," from the fact that on various occasions patients had, from sundry reasons, neglected presenting themselves at the time appointed for the removal of pulps, and had allowed a number of days to elapse which were, according to the books, sufficient to induce great trouble; but to my surprise and gratification nothing in this direction supervened—an occasional story of "pain," an occasional day of tenderness which had passed away, made up the total, and seeing no reason for other treatment than extirpation and plugging, these were performed, and the teeth yet doing good service. Cases accumulated, examples of which may be found in the following:

Case 1. Miss H. Sanguo,—Lymphatic temperament, application to 2d bicus. sup. left, made appointment for the third day; that afternoon the lady left the city to visit a sick relative, sent word to me next morning; returned in *eight days*, presented herself to make another appointment. I immediately removed application and extirpated pulp, *some sensation* and slight hemorrhage; filled the tooth one week

after (my usual practice). It is now over three years since the tooth was filled, and it has been and is perfectly comfortable.

Case 2. Miss A., æt. 18; Nervo-lymphatic, loose tissue: teeth whitish yellow, soft structure; application to 1st molar (6 year), sup. left. Without keeping her appointment for the third day after, and without advising me of her intention she left for home (Alabama), returning in *six weeks*. She had not experienced any trouble; the application, covered with a cotton Sandarac plug, was just as I had left it, no irritation about the tooth; it was prepared and filled, and two years after was doing good service. I have not heard from it for fifteen months.

Case 3. Mr. P , merchant—bilio lymphatic; æt. about 40. Application to left sup. central incisor. Left for New York the next day, and a day or two following, was obliged to sail for Europe on business. Presented himself *eleven weeks* after; sandarach plug still covering application; pulp slightly disagreeable—no soreness. Prepared and filled the tooth; saw it about two months since, doing well after having been plugged nearly three years.

Case 4. A coachman applied to me during the month of June, 1858, to obtain relief from "general toothache in the left upper jaw." Upon examination, I found much redness of the gums; great tenderness upon striking the teeth, and a large accumulation of salivary calculus. While engaged in demonstrating to my students its removal, I discovered a cotton plug sunken into a cavity of decay upon the articulating face of the second molar; and upon inquiry he informed me that it had been placed there during the preceding winter! by one one of the class at the Dental College, for the purpose of "killing the nerve," with the directions that he should return the following day; from some cause he neglected doing so; the tooth gave him no trouble, and when he went again about a month after, he found the College closed! so he allowed things to remain as they were. I took away the cotton, found the usual "small piece" underneath,

washed out the tooth, made an application of hydrated sesquioxide of iron in paste form (an application which I then thought favorably of theoretically, but which I now have no faith in practically), and putting a temporary filling in the cavity, intending that the tooth should be plugged by one of the young gentlemen, *I finished removing the tartar* and gave an astringent mouth-wash. At the expiration of two weeks the gums and mouth generally had assumed a normal appearance, and all tenderness of the teeth was relieved. This application had remained in the tooth between *four* and *five months.*

These are but few of many cases which have come under my observation, as the result of accident or neglect on the part of patients, and they seem to me full of interest and instruction; for it is a matter of great moment, both to dentist and patient, that this operation of devitalization and extirpation should not only be thoroughly understood, but properly, and if possible, painlessly executed. It also seemed in the line of duty, that the information which had been gained as the experience of unintentional practice should be cautiously verified as the basis of future operating; I therefore instituted a gradual *increase of duration of applications*, watching carefully the cases, until year after year told me that I could with perfect safety permit them to remain until the pulps were dead and had sloughed,—thus rendering their entire removal a thing easy of accomplishment, and doing away with all the terrors to the minds of those who were about to submit to the operation. After having demonstrated this, I commenced saving such pulps as had been exterpated entire and without pain, as the result from seven to fourteen days' application each. I tested ten of these together for ars. acid by Riench's test, which possesses the *requisite* in this case of giving the amount of this substance present; a proof of its presence was obtained, which was *duplicated* in a solution containing 100.000th of a grain of ars. acid, thus giving as the amount contained in the tissue

of each pulp the one-millionth of a grain! Ten pulps, exterpated painlessly and entire, were next taken and tested, with about the same results; while from the ten cottons upon which the applications were made, quite one-third of a grain was obtained,—thus showing that no *apparently* adequate amount of ars. acid had been taken up by the pulp tissue, and that death of the organ having ensued, the dead tissue had acted for so considerable a length of time as a preventive to further exhibition of the poison. The results of these experiments seemed to me to present the solution of one of the sequences of arsenical pulp treatment, to-wit: the subsequent putrefaction.

The assertion was made by Dr Goddard some eighteen years since, that the dental pulp was preserved, if destroyed by ars. acid. This is entirely incorrect; and had he known the minute quantity of this material which really entered into the tissue destroyed, he would have been no more at a loss to have accounted for the putrefaction of pulps, than dental pathologists now are for the *length of time* required for decomposition to take place. Simultaneously with investigation in relation to the foregoing subject matter, experiments have been in progress as to the most desirable and efficacious of all the proposed recipes offered to the profession,—attention having been particularly directed to the purpose for which each ingredient was advocated, its fitness for the accomplishment of its mission, *the absolute part each performed*, and the construction of an appliance which should best subserve every indication. I have the following results to offer: Ars. acid in dry powder will accomplish the required devitalization; but its exhibition is productive of much pain in a majority of instances. Ars. acid, moistened with water, acts more promptly, but is equally objectionable in a majority of instances, on account of pain. Ars. acid moistened with essence of peppermint, tincture of opium, oils of cloves, anise, etc., gave the same result—generally much more pain than was satisfactory. Ars. acid and oil of

creosote afforded decidedly the *least painful mixture of two* ingredients which I have at any time tested; but its effects were not always satisfactorily thorough, and an occasional case would demand imperatively that a modification of this application should be made; these were invariably patients in whom the "nervous" was the basis of temperament,—as the bilio-nervous, the sanguo-nervous, and the true nervous. Dry mixtures of ars. acid and acetate of morphia, sulphate of morphia, carbonate of magnesia, etc., offered modifications both as to commencement, intensity and duration of pain, but all were found objectionable. Paste made of these latter combinations. together with such oils, tinctures, etc., as have been mentioned (with the exception of creosote), proved in many instances painful and sometimes productive of intense suffering; which condition was almost invariably relieved by a gentle application of creosote,—idiocyncrasies only presenting exceptions.

Creosote, then, seemed to be the ingredient which most markedly modified the amount of pain; and it was the knowledge that creosote possessed this property of obtunding sensibility that induced my father, who was the first to use it so long ago as 1836, to suggest its employment. It was *for this purpose*, and not on account of its supposed power of dissolving ars. acid, as is the impression with some, that this oil was introduced in this connection; and indeed, I have experimentally proven with eight grains of ars. acid and eight drachms of creosote, that even with long-continued and thorough trituration for hours, and frequent daily shaking for weeks, the acid was insoluble in the oil.

But ars. acid and creosote was proven upon patients to be occasionally objectionable, and its action was shown upon frogs to be much more intense and promptly fatal. This result was suggestive of the explanation of such trouble as had been found to accrue from the use of this combination; and it was theorized that too great irritation produced too rapid congestion of the bulbous portion of the pulp, preventing,

with arrested circulation, the possibility of the introduction of a sufficient quantity of the "essential principle" into that portion of pulp tissue occupying the canals of the fangs, and at the same time inducing the pain consequent upon rapid motion and pressure of blood upon the nerve peripheries before the creosote had sufficiently penetrated to paralyze them. It therefore became necessary that a preventive to this rapid irritation should be introduced, which would combine three requisites—bulk, solubility, and absence of irritating qualities either mechanical or chemical. For this purpose the acetate of morphia was suggested by Dr. Spooner, almost simultaneously with that of ars. acid; and careful experiments have satisfied me that as yet no other article so well adapted has been proposed. Its bulk is sufficient to insure that in equal parts by weight with the acid, only enough of the latter shall be brought in contact with the pulp, to be about one-fourth as irritating as the arsenic alone. Its solubility is such as to insure a gradual and constant renewal of the presence of the irritant; its mechanical and chemical compatability with pulp tissue I have demonstrated again and again, before making applications for the desired devitalization, and the average contrasts most favorably with that of any other proposed substance of which I am cognizant. The *form* of application has two classes of advocates, —those who keep their remedies dry, moistening them at the time of using, and those who prefer pastes. I think the latter form possesses every quality, so far as efficacy, etc., that pertains to the former, if made of the proper consistency, which is, a paste so stiff as to *prevent* the settling of the ars. acid through the acetate of morphia. If too thin, this will be demonstrated by layers, first and lowest, ars. acid; next the acetate of morphia; and covering the top as with a glazing, the creosote.

It is conceded that the objection which has been urged against the use of sulphate of morphia, to-wit: its decomposition leaving free sulphuric acid, may have some weight in

the consideration of a choice between it and the acetate; and we have the authority of standard works on Therapeutics for the position that the latter salt is preferable for endermic applications; but still another reason with myself for its employment is, that while in all other respects it is regarded as the better, it possesses in addition a specific gravity much nearer that of ars. acid, and consequently is not so liable to interfere with the mechanical combination, which alone forms a paste of ars. acid, morphia and creosote.

I have said that a properly proportioned paste possesses, experimentally, an efficacy equal to the recently mixed dry powder and creosote; and I have thought it reason sufficient to prefer that form, from the greater accuracy with which the desired amount may be *placed in position*, either upon cotton or with a delicate instrument, and *retained there*, particularly in upper teeth, while it is securely protected from danger of being displaced or dissolved by external agencies. The formula which I am using at present is—

℞ Ars. acid, gr. i.
Morph. acet. gr. x.
Ol. creosote, gtt. v.

by rubbing thoroughly for fifteen or twenty minutes upon a druggist's slab, as usual in compounding such recipes. Having made the *usual sized* application, containing, as it will, about the 1–200th of a grain of ars. acid, fairly and gently to the surface of the exposed pulp, and having secured it thoroughly with a plug of cotton merely moistened with a thin solution of gum sandarac, I allow it to remain for ten days or two weeks, at the end of which time I can almost invariably remove the pulp and without pain; if some sensation still exists, demonstrable by probing, *I replace the same application* which had already been used, and give a few more days for the completion of the process of devitalization and sloughing. It is the almost universal experience that after an application has remained in a tooth for several days, soreness of the organ supervenes; tenderness upon occlusion,

slight pain from striking, etc., all indications apparently of periosteal difficulty; *but these same conditions are concomitants with the dying of the last portion of pulp no matter from what cause*, and if a pulp be extirpated during the existence of this condition, it will, under the microscope, present an appearance which will clearly indicate the reason for such tenderness, in the evident absence of vitality in the greater portion of tissue, and the equally evident presence of high inflammation in that portion immediately contiguous to the apicial foramen; there will, moreover, always be pain in the extirpation of pulps at such times, *but if every thing be permitted to remain undisturbed, all trouble will pass away in a few hours*, and the usual quiet and comfortable condition which we know to supervene upon the absolute and entire loss of pulp vitality will be the desirable consummation. I usually allow an application to remain several days after this "tenderness" has passed away, knowing from experience that the external irritation consequent upon the sloughing of the pulp, at the apicial foramen, will by that time have been sufficiently subdued by the *vis medicatrix naturæ* to permit of dental manipulation with no risk of engendering after trouble. This method of procedure has now stood the test of several years, with uniformly gratifying results both to patients and to myself, and will, I think, only require a few trials at the hands of any competent practitioner to commend itself to favorable consideration. I say "competent," for like almost all valuable remedial agents, ars. acid is potent for good and *very potent for harm*. Much has been said of the danger of its *use*, but an extended observation and experience convinces me that it is to its *abuse*, that all the evil results which have positively attended its exhibition are to be attributed. I have met with three cases and now possess the specimens, in which applications had been made *through* the fangs, until the periodonteum was destroyed and necrosis was the natural result. I have also in my possession two teeth (second bicus. and first molar) which, together with all intervening struc-

ture, were destroyed by persistent arsenical applications placed in a cavity upon the posterior face of the bicuspid; this was doubtless the result of insufficient protection, for we know ars. acid to be somewhat soluble in water, and through the exit which would be afforded by a simple cotton or defective wax plug, the saliva would be alike the menstruum and vehicle by means of which, as shown by actual experiment the 1–25th of a grain of arsenic, the usual amount employed, would be capable of producing most disastrous consequences. It is, therefore, neither more nor less than folly to feel secure in the direction of "deplorable results," merely from the fact that if the whole amount applied be swallowed the patient will not die! for singularly enough, it is true, that swallowing the application, cotton and all, would be the most positive way of ensuring no possible harm as the result of inability and ignorance! It is, then, a matter of much moment that an operator should possess at once a reliable degree of information as to special dental anatomy; diagnostic ability sufficient to distinguish as to whether trouble comes from the inside or the outside of a tooth, and manipulative skill adequate to the prevention of the action of agents employed, in any other than the designed direction. With these requisites, one *must* be successful in the treatment of teeth; without them, all good results are but the fruits of fortunate blundering, and all signal failures and dreadful consequences nought but what might have been reasonably expected.

DENTAL PATHOLOGY.

BY W. H. ATKINSON.

How long have we had any thing worthy of the name? Or, rather, what have we worthy to be called Dental Pathology?

As physiology underlies pathology, just as anatomy does a true physiology, so we must, in the first place, be made acquainted with physiological functions of dental structures before we are entitled to put forth statements of what are normal and what are abnormal manifestations of the functions we find at work in teeth.

Pathology can be nothing else but a perverted nutrition, and, therefore, *dental* pathology would be a matter of but little moment, if teeth had no living connections whereby their pathological conditions were incited in surrounding tissues and organs. In fact, it is the unity of relationship of parts that gives them significance, whether it be in systems corporeally aggregated or socially constituted.

So that a complete Dental Pathology implies, also, complete knowledge of entire system from inception to culmination, integration and disintegration with all the individual progresses and regresses of the acts of living bodies.

Writers have heretofore said there were dynamic and chemical actions going on in all cases of pathological changes; which is well enough, if we actually apprehended that these are but degrees of the same action, action always *expressing* dynamic presence, which proves its *omnipresence* to minds capable of the conception that actions are both *seen* and *unseen*, apparent and inherent—the latter always holding the relation of cause to the former, which is but one phase of effect, indicating the work of dynamis, or essence of all movement—ert and *in*ert.

Our apprehensions make no difference as to the facts that occur, but they are all important to enable us to arrange ourselves under the law in coincidence therewith, this being our only absolute safety. To be sure we may happen to fall into correct conclusions without knowing why, but all such results are irregular and uncertain, and, therefore, do not constitute criteria for our future guidance.

A state that would be pathological, if present in a well-developed organism, might be *physiological* to many who had never risen above such an action in their highest expressions of their health.

So it becomes necessary for us to know the normal condition of each specific organism before we can recognize, defferentiate and assert the conditions of health and disease pertaining thereto.

A given organ may be partly healthy and partly diseased, which classifies it, as an organ, among the latter; but our means of restoration will differ very essentially in accordance with the portion diseased, and the degree of disease under which it is found; local means meeting local indications, while general degeneracy must be met by constitutionally adapted methods of restoration.

Where the vitality of the organism is high, probably both local and general remedies will be most conducive to rapid and permanent improvement.

When questions are propounded the seed is sown, and all that is needed thereafter is to see that it be well watered, by careful attention, until it germinate and sprout, keeping out rank weeds, so liable to choke it in the rich mental soil of earnest inquiry, until its specific and distinctive character becomes apparent, when it is easily differentiated from useless trash.

The best way to advance is to use what knowledge we have in the direction of a sound dental pathology to the best advantage, at the same time keeping a sharp look out for all abberrations from healthful standard which present them-

selves, noting each in character and circumstances of appearance, etc., etc., that we may deduce the law of diagnosis and cure.

In the way of the surgery of an indiscriminate slaughter of the oral tissues, we have more written and practiced than in the way of an intelligent pathology of teeth and their connections.

It seems an easy task to reckless ignorance to heroically tear out of sight, and out of the way of future criticism, the sound and unsound teeth alike, which stand in the way of setting the vauntedly preferable substitutes of the cheap and miserable quackery of the times.

But those things which seem so capable of enactment and concealment are not so, in fact, to any but those whose vision is obscured by the hope of speedy attainment of the unclean pay for an ignorant and unclean rendering of a service that should be for the good of recipient first, and performer afterward.

If we could dispossess ourselves of our property in the blunders we make, and hold on to that of our successors only, at will, there would be less apparent necessity to avoid the doing of evil to others in the vain hope that it could be a good to ourselves.

A sin committed against one member of the race necessarily infracts the wholeness of the law of perfect service, and must have its recoil, most intensely, upon him who perpetrates it.

All are quite willing to hold fast to all the credit and reputation that can, by implication, belong to them, until they begin to open their visual or perceptive power to the beauty of justice and eternal truth!

It is the injustice of regarding the meum with more attention and respect than the tuum, which unsettles the balances of right as between individuals and classes—professions and people. Hence, he who makes an hasty or imperfect operation for his patient, because he can make more money, in less

time than he could, if he took the necessary time and careful toil to make it up to his highest conception of goodness of use, has disturbed the balances of justice as much against himself as he had hoped to against his victim.

The great sin of young people and novices is, to regard themselves *entitled* to all the immunities and rewards which they see accorded to the most advanced and most capable in the various professions and callings incident to the activities of this life; without first putting themselves severely to the test of examination as to capability, which would, in many cases, save them the humiliation of taking a lower seat than they had appropriated to themselves.

Were a bare materialism of service all that the legitimate exercise of a profession required of its votaries, the mere outward facility of manipulation would be the highest expression of professional skill.

But as the highly etherial exercise of mental and moral purpose is even more important to complete success than merely scientific accuracy of mechanical execution, it will be well for us to study the reasons of this, that we may give honor where honor is due, and be enabled to recognize the particular instruments, whether medicinal or surgical, which are best adapted to convey our best wishes and endeavors to those for whom we are called to restore soundness to life or limb.

The great physician's word and touch were alone, or combined, the most frequent vehicle of his healing power. And let us not forget that he plainly told his followers that *they* should do still greater wonders in case they were earnest followers of that which is good!

I am aware that most men engaged in medicine, surgery and dentistry depend much more—if not wholly—on chemical and mechanical forces, than dynamics, for the performance of the purposes of their calling.

We might just as well hope to enjoy vigorous life by eating heartily and drinking pleasant beverages to repletion,

and cutting off all contacts of atmosphere in which the unseen life elements await the opportunity to inflow to these pabula when made fine and fluid enough for them to find lodgment there for the use of the system to which they have been so occultly introduced.

Air and food, properly admitted and combined, insure the full nutrition of healthy systems; so a full knowledge of the whole range of forces in living beings will lay the best foundation for an intelligent application of chemical and mechanical displays of skill to avoid or relieve and cure diseases.

Not long since it was deemed among the undoable feats of practice to save a tooth with an abscess at the point of its root.

And many who call themselves first class dentists are ready to visit with the pains and penalties of malpractice, those who are enough in advance of them to undertake and save cases which are out of their reach, only because they are willing to tarry in past experiences and authorities, rather than make earnest inquest for truth, even though it be in an untrodden path!

By such inquiry I have discovered that very great degeneracy of the processes and maxillary bones are yet amenable to judicious, constitutional and local treatment.

There is a tendency to solubility of the cancellated portions, particularly of the jaw bones, in which the alveoli ramify, induced by constitutional degeneracy from syphilis, and the poisonous effects of mercury, which have been deemed only curable by the extraction of the teeth; and vigorous medication, that yield much more readily to very gentle medication and persistent refusal to kill what portions of bone yet possessed vitality and some solidity, by ruthlessly extracting the loose dangling teeth, held by the soft parts and thin strips of the very margin of the alveolar processes.

Thus avoiding the loss of the teeth and the contour of the features by the sweeping destruction of wholesale sloughing,

if not death, almost certain to follow such unskillful and untimely interference with nature's efforts to remove the old and deposit new and stronger processes in which to enclose the roots of these loose and seemingly useless teeth. This is no fancy sketch! It has occurred so often in actual practice, that I now wish to announce it as a step in dental pathology in advance upon all that has heretofore been known or practiced.

The treatment differs in accordance with the time the case comes into hand for diagnosis and management!

If the soluble state alone be present, and no necrosis of any of the denser portions of bone, the knife and enucleating "spud" is not necessary to be brought into requisition.

But where death of bone has set up a fetid discharge into sacs, with sinuous openings or no openings, then it becomes necessary to discharge the accumulations of broken down and effete tissues as speedily as possible.

Then peel off the living periosteum from the dead and dying bones as far as nature indicates, removing the latter entirely from contact with the living parts, and extracting them whole or peacemeal, as the case may require; after which suitable dressings will induce a rapid return to health, and deposit of new bones instead.

The difference between surgery and butchery is, the first restores and saves life and limb, while the last kills and destroys limb and life. Dental surgery has strictly followed general surgery in the recklessness and haste of the earlier surgeons in practice, and now it is to be hoped she will also follow the lead of medical men in dividing the profession into specialties, thus affording to each greater opportunity to acquire that skill, knowledge and ready dexterity which so rapidly advances all by a judicious division of labor.

How long is it since the medical man, as a class, has advised his patients, with diseased mouths, to "consult a dentist?"

In the larger cities and more populous towns, this now

begins to be done, but it first had its initiative through the irksomeness to the physician of "extracting teeth," the thing which was then supposed to constitute one half the practice of the dentist, while the other moiety was to insert on pivot, wires, and strings, artificial teeth made of ivory.

If, from such beginnings, such results as we now see daily practiced throughout the length and breadth of the land, and the world, have been attained, what may we not hope for "dental pathology and surgery" in the course of a few more years of earnest effort on the part of those already in the field, and the still brighter and fresher geniuses who are fast giving the attention demanded by the nature of the degeneracy of dental tissues and general systems, in consequence of the shameful neglect to secure to the rising generation well developed, sound dental structures, including teeth, jaws and gums.

All of which, when healthy, have such potent influence on the health of the general system, in minutia of detail and sharp scrutiny of general principles, which will soon enable the whole body to come together, to compare, codify and do for the science and art of dentistry what Euclid did for mathematics, viz., eliminate every thing but truth and fact from our knowledges, thus rending demonstrative and certain the principles of a true "dental pathology and surgery."

A true dental pathology will explain the suddenness of the supervention of pathological conditions, and their apparently causeless extinguishment, such as "edged teeth," and tenderness of those having cavities filled, or not filled, in them, penetrating to the dentine, and those worn down on the "biting" surfaces, exposing the dentinal structure.

I have known these conditions to arise so suddenly as to very much disappoint both patient and operator, and force them to postpone operations or pursue them amid great suffering to them both—I say to both, for no humane operator can composedly and pleasantly go through with his work that

shatters the very sentient nature of his patient at every stroke of his instrument.

Many susceptible persons will have sudden tenderness of their artificial dentures, where no natural organs remain to which to refer the sensations; this is, however, much more frequent in cases where both natural and artificial teeth occupy the same mouth.

It is of common occurrence to have this sudden soreness take possession of loose teeth which have been denuded of gum process and periosteum for a considerable distance from their necks, permitting a sort of swaying movement from the contact of the tongue, lips, food, etc., etc.

This special variety is so very sudden and common, that it is liable to make its attack and exit once or more during a single meal.

A variety of this tenderness arises from aphthous patches beneath the tongue, on and by the sides of the frenum, while almost the whole buccal spaces of mucous membrane may be dotted over with the aphthæ without giving rise to the sympathetic or other action, whatever it is, in the attachments of periosteum and the exposed dentine.

Another variety of it occurs in cases where the molars, but, particularly, the dens-sapientæ of either jaw are decayed: the patient will come to us complaining of a sudden and unbearable tenderness in an incisor tooth, which they often imperatively demand to have out. During the examination to ascertain the cause of the difficulty, we sometimes can not verify the statement, and are about to dismiss the case as a notion of the patient, when a better thought tells us to look further, and, lo! we find a wisdom tooth above or below, which, when we touch, the patient cries out—"There, that is it; I told you so," and places his finger upon the same incisor he had directed our attention to, in which we could find no signs of pathological conditions; these cases have occurred so often to me, that I invariably look among the molars for the disease,

after a moment's glance at the incisor charged with the vice.

In a few instances a real disease has manifested itself in the incisors simulating idiopathic periodontitis, which is readily cured for the moment by the magnetism of handling it, if the case have not progressed too far.

This last class of cases completely exculpates the patient from the charge of being notional about the matter, and referring the pain to the incisor, simply from an irregular or careless observation.

It will be observed in these cases, that there was no knowledge of the disease in the molar, the real seat; somehow so soon as we discover the seat, and yet, the patient's mind, directed to the point of disease, he afterwards refers his pain to the molar.

Here arises the pathological inquiry of how these points are related, and how it first happens that the pain is referred, as has been said, "sympathetically" to the incisors, in preference to the canines or bicusped, or a neighboring molar, all of which are more intimately connected by relationship of tissue and nearness to the seat. All the attemps at explanation heretofore have not risen above mere hypothesis, satisfactory only to him who propounded it and those who prefer to accept explanations as given them, to working them out to demonstration for themselves and all who come after them.

Molecular degeneracy being the cause of all pathological change, is the true key to unlock the hidden mysteries of the whole range of dental and other diseases.

When this action continues until the incisor becomes involved in periostitis, it sometimes occurs that the congestion of the foramen chokes off the circulation, and the pulp dies of atrophy without in the least degree impairing the usefulness of the tooth; the atrophy cures the periostitis by an action not well understood, and leaves its card in the shape

of what is called a "dead" tooth, which performs as good service as ever, in all but looks.

The facts are before us all, and had we the philosophy they foreshadow, there would be less diversity in our methods of cure.

Most dentists depend upon local applications for the cure; physicians generally upon "constitutional" treatment; a few combine local and general treatment, and, when judiciously selected, the results justify the course in the production of sound and permanent cures.

Immediate relief being the end usually sought, extraction has been more generally resorted to than the more difficult and scientific methods of restoration.

This off hand way of disposing of troublesome cases has hidden from our eyes their true nature, and has prevented our having a ripe dental pathology for their explanation.

But, because we have been bullied into blunders until blundering has set itself up for scientific intelligent practice, it should not shield us from just odium and reproach, if we continue therein after we can no longer "do it *ignorantly*."

As in every house there are many vessels for service, so in every profession there are many members, and of these some honorable and some dishonorable, each counting himself among the former, let us strive, therefore, to see that our claim is just.

Doubtless a tolerably full and accurate dental pathology might be compiled from the various works on medicine, surgery and dentistry, in the shape of text books, for professional and popular reading, fugitive pieces in the various journals, etc., etc.

But this would involve as much labor and more conflict than to cut one out of entirely new observations, which might confirm or disprove the various doctrines and hypotheses set forth in them, or altogether open up fresh and new fields of observation and deduction, by instituting experi-

mental research in the near and remote causes of diseased actions of the dental structures, and those nearly allied to them in position, identity, similarity, or diversity of structure.

A correct dental pathology would very soon define the limit of our capability to benefit teeth and their attachments, after they once had become seriously diseased. It would also indicate to us the proper prophylaxis whereby we should be enabled to do infinitely more good to the world, by taking in hand the infants and youths of ignorant parents, and instituting such regimen as to preclude the possibility of pathological changes ever taking place in their teeth.

Thus in a few generations we should have an educated community of those liable to become parents who would almost instinctively obey the laws of physiology, thereby abnegating the use of pathological knowledge to all but those who have been so unfortunate as not to have come under the influence of the education of a known and established correct dental pathology, based upon a full and accurate knowledge of the physiological activities of cell, germ, pulp, and tooth, entire and complete.

Until the happy pair in Eden knew they were naked, they had no thought of clothing themselves, or how or with what their garments should be made!

So in every other department of the needs of life—a need becomes such only upon recognizing it, and usually they grow out of the ignorant infraction of law.

The nakedness of our jaws first called attention to our teeth, and suggested inquiries for the causes of the devastation, and then for the methods of remedy, and, finally, is it possible to avoid the painful experience to our children and friends?

These suggestions opened up the whole field of anatomy, physiology and pathology, whose intimate study has done—and is doing—the work of prophylaxis very rapidly.

If we will now, as a body, resolve upon some plan by which

all the knowledge in store and to come into our possession shall be recorded and preserved, we shall very soon banish incompetence and all its baleful concomitants from among us, and our needy patients, by thus clearly defining the lines of demarkation, that there can be hereafter no possibility of mistaking impudence for science, or ledgerdemain for skill, and thus institute the reign of intelligent peace between profession and people.

If our first parents had not have made the discovery of the difference between them and the animals, which nature had provided with covering, they must have degenerated into the merely animal range.

But having displayed powers above brute intelligence in the discovery of nakedness and the effort to remedy it, they had made the beginning of establishing what are called "artificial wants," which always indicate increased intelligence. God was the first architect of clothing, as of every real work of utility in the whole range of want and supply. For he who discovers or creates a new want suggests queries of how it shall be met, and nature is so prolific in resources, that the most fanciful pursuit is sure to more than meet with adequate response, if we do not flag in our efforts, or give up the thread of our purpose.

Then, if the breaking of a low primary law be the occasion of advanced intelligence and increased light—let us judge, with kindly consideration, the blunders of our fellows, and ourselves, in testing our capabilities and the applicabilities of means, even by most heterodox procedures.

After we become instructed, it is common and easy to laugh at those who make the same blunders in kind which taught us how to avoid them. And, somehow, we have a wondrous facility of forgetting our sins of the past. Happy is it for us if they have not left such indelible soul-scars that their ineffaceable presence do not remind us in our sober moments, that we have great cause to extend the mantle of a broad charity over the foibles in character and defects of

skill we discover in our brethren. With an earnest prayer that we may be led into higher and more effulgent light in all that pertains to an advanced Dental Pathology, I commend you to the guidance of the angel purveyors of an "open vision."

HAS DENTISTRY ATTAINED TO THE DIGNITY OF A PROFESSION?

BY W. H. ATKINSON.

With a very few it has, both in clear apprehension of theory and judicious exercise of patient practice: but with the vast majority it does not rise above the groveling character of mere trade, a scramble for pelf without a care for the cleanness or uncleanness of the pay received for the indefinite exercise of skill or charlatanry.

In what does a profession differ from a trade?

Ans. In being the exercise of superior intelligence for the good of those devoid of knowledge or capability, while legitimate trade is for the mutual benefit of exercisor and exercisee.

Profession implies possession of the latent uses pertaining thereto, ready to be activated at the moment of demand to all in need; because it does good by supplying the need. The moment the balance of reciprocity is lost, trade ceases to be legitimate; but profession is legitimate so long as it finds good to do, and has the means of accomplishing it.

Being omnipotent when coinciding with law it is exhaustless as infinity itself, because of the relation of the goodness of use, which is itself but the mode of procedure of the divine beneficence, in which good is done to the thankful and the unthankful alike so long as in need.

Thus we see the higher exercise of professional function to consist in the nearer approach to god like actions. The dental profession is so nearly allied (in fact often merges in) to trade, that it would be hard to find a purely professional representative now in our body.

But the time is fast approaching when truer relations will be established among men, when the amount that any one adds to the means of happiness in this world will be the only measure of merit: when men will not have to wait tens of centuries or many generations to have the world grow up to the acknowledgment of a true service to the race in any work of brain, heart, or hand.

Creation is the only legitimate right to possession! Hence those who do not work some work of utility shall no longer falsely grow fat upon the creations of others. Nor shall this divine right of production be denied to the humblest worker in all the domain of use. Nor shall robbery and imposition longer dispossess these of the inherent right to possess what they make; though hand join in hand among the learned in wickedness to accomplish the fell purpose of privation, Truth, Right and Justice must at last prevail everywhere.

At this stage of the advancement of mental and moral science, it demands more than common ability or common honesty to rise above the mercantile spirit of the age.

But two classes of men are above this, to-wit: those who were born independently rich, and those who have attained the true riches by the sharp experience of life enabling them to refer all power, mental, moral and financial, to its legitimate source—the goodness of use. Had we one example of a whole man who had passed the ordeals unscathed, the type would be before us and all we should thereafter need would be to realize the type.

Professions, like trades, grow out of the necessities of the race, and necessities grow out of perversions or infractions of law; and these all grow out of the primary state of ignorance in which all persons are born into the earth-life, and method of existence in time and space.

Professional and all social bodies, like natural bodies, have a point of inception from which they revolve until they are projected into distinct individualized being. And it is mani-

festly unreasonable and unjust to expect or require adult functions from childhood, or those of childhood during merely fœtal stages of life.

Bract and calyx are as necessary to complete the rose, as is the corrolla which is more deferentially designated on the rose. And as the corrolla is higher and finer, and has a richer dower of fragrance and color, it is natural that the humble stages of evolution from the point of inception should be less regarded by the superficial observer, because they are unostentatious and patient to the degree of willingly being lost to partial inspection that they might sustainingly cling to the beautiful and fragrant flower their labors had perfected. In the rose, bract can never rise to the dignity of being transformed into a calyx, nor this into petal; but in some forms of the phanerogamic such metamorphosis does obtain. And it is a great comfort to us, to know that these stages in us are but states out of which we may grow by the proper culture, and thus at length attain all our highest ambition can prompt.

As in Nature the latest upheavals produce the most elevated mountain ranges, so the more recent professions must represent all that has preceded them—adding the particularities of their own bodies to all the foregoing, thus constituting the higher types of certainty of use.

And such, I am happy in being able to say, the science and art of the dental profession is fast beconing. If it is but an infant, it is nevertheless the infant of a giant body which will make itself recognized, in a fraction of the time it has taken the earlier and less demonstrative professions to become fixed realities and acknowledged necessities to the well-being of society at large and to individuals in particular.

The practitioners of dentristry are divided into profession and pretence,—the first is the intelligent exercise of the calling, the other is the blundering attempt to imitate it. And in the light of the past and present, it will not do to assert that the latter will never attain the former position; for

twenty-five years ago no one had conceived of the degree of success that now attends the judicious treatment of exposed pulps.

Alveolar abscesses and diseased antra, all of which now so kindly yield to intelligent persistent effort, coincident with the integrative and disintegrative laws pertaining to these tissues.

Dentistry has progressed from an impirical imitation and blind following of tutor and recipe, to a clear apprehension of the manipulations of the handicraft of a trade, to which a few add the liberality of a true profession by freely publishing principles and detail so fast as discovered or proved.

Discoveries often die with their authors or fail to be appreciated; so it often falls out that one makes a discovery; but not having the good fortune to bring it before those who over-ride or ride upon the inventive mind, it is left for another to prove it to an astonished auditory, and thus reap that he did not sow and gather bountifully where he did not strew arduous labor.

It requires good fortune, great humility, or great boldness, to announce and maintain any great advance upon the (hypotheses called) known principles or practice of the times,—especially if it be in opposition to the authorities holding the dominion of doctrines.

For though the discovery of principle or method be clear and certain to the individual making it, the acceptance and adoption by those most in need thereof is not so easily nor so certainly attained.

Integrity as a body is what we as Dentists lack, to constitute us one of the most advanced of the profession.

Our material is good and abundant, just as is all material within the whole domain of use. Bring together, correlate in harmonious arrangement and in living coinciding unity the abundant loose, rough material which is scattered over the vast extent of the various fields of practice, and we *shall have* a profession of surpassing brilliancy and excellence.

Isolation and earnestness facilitate the influx of inventions through inspirations induced by our necessities; but it requires association to disseminate these useful discoveries, so they may be proved to and used by the masses of workers in all professions who are averse to dig deep and lay sure foundations for the beautiful and enduring body of our corporate presence called "The Profession."

He who would be the apostle of new and high discovery and certainty of principle must be self-sacrificing to an extent distasteful to the selfishness of the merely mercantile type of mind that holds the dominion of this age.

All that we possess as a body we owe to association of effort and comparisons of the knowledge or skill resident in the individual members composing the profession. For so long as it be only known to living isolated persons and not put upon the record, or though it be recorded and the record isolated, it is lost practically to the great body of the profession and the world.

Let us record, compare, prune, and complete, by codifying our experiences, and we will soon have a profession of correct principles and practices.

Guess, cut and try was the beginning out of which grew the necessity for correct models of the arch to be fitted. Molten sulphur, beeswax, plaster of paris, gutta percha and the whole catalogue of our now indispensables, lay in nature's lap quietly awaiting appropriation.

Lead, fusible metal, tin and gold, with every compound of these, and all else of resistant power to the solvent and mechanical action in the mouth, are of but *prospective use* to the dentist, until the cunning craftiness of ingenious head and hand have so metamorphosed them as to bring them into such states of mobility and plasticity as to facilitate their impaction within the disintegrated portions of teeth called cavities of decay; thus restoring the lost integrity of parts, and proving the latent good resident in them for such purpose by the proofs of *use*, by which test they must stand or

fall in accordance with intrinsic merit and appreciation of those who need them.

Moral, mental and social *in-teg-rity* are the necessary elements of harmonious organization. It was the want of these, one or all, that fulminated the discords and contentions out of which the failure of so many attempts at association have grown.

The particular efforts in this direction, that have signally exploded, are before us and the world; but to name them might be deemed invidious, and still further foment the disruptive elements that have, in some degree, subsided into at least a silent negation, if not tacit acquiescence, in the later and better efforts to bring order out of confusion, and harmony of sentiment and interest out of the clashing of imperfect doctrines and destructive practices consequent thereupon. It now begins to be acknowledged that the dental fields of science and art are large enough to employ all without collision or conflict, other than the sharp collisions of who can best understand and the noble emulation of who shall best perform the various manipulations of our Noble Art for the restoration of lost soundness or imperfect parts.

How shall we be sure of always having good associates? This depends upon our apprehension of good, for all denominate those they like, "good fellows," "one of the best men," "a prince of a good fellow," "none better," etc., etc. It is said "the very Devil loves his own."

The only method for us to become better is to live fully up to our present apprehension of good,—never to do that of which our best powers disapprove—in a word, be momentarily in such a state as to invite the highest ideas to inflow to our consciousness that it is able to receive; and then we will always be in a state of mind and purpose to catch the purer truths devoid of the deflections and colorings of selfishness and error, which are sure to possess us if we tarry in the lower and more commonplace states of our being.

If a man seeks to leave an irreligious and sinful course of

life, he naturally seeks the society of religious and reliable people; so if he wishes to become a lawyer, he gravitates to men whose minds dwell upon that department of philosophy.

If he wish to become a physician, he seeks the society of those who habitually dwell in the presence of the spirit of the profession in the culture of anatomy, physiology, pathology and the affinities of bodies with each other in simple and complicated states.

So then, it is easy of apprehension what sort of good the lawyer most complacently contemplates, and so of the religious man, the physician, and all varieties of coteries of men of which the complete man is the embodiment.

Now if we would have a harmonious Dental profession, we can secure it by the exercise of true honesty and earnestness in living out our highest conceptions of elevation at the time, which will be the means of rapid growth in not only the knowledges which are at the foundation of all true greatness, but those that lie in the body and top thereof, ready to be brought into activity of use in all our efforts to do good in practice or teach the way to such as are earnest seekers.

With our mentals thus polarized, we become magnets to which pure and elevated intelligences gravitate, which always are in waiting to inflow to all who are ready and capable of entertaining the angelic visitants in the form of idea, thought, opinion, belief, or an admixture of these stages of mental labor necessary to the attainment of knowledge certain and clear.

And thus our time is occupied in the direction of rapid mental, moral and professional growth, equal, persistant and steady; while those who are preoccupied most of their time in the groveling pampering of low appetites and petty ambitions will be astonished! and inquire how it is possible there should be such a difference between them and those who started on a level with them, but took the former course! The solution of which is so plain, that none but those blinded by obtuse vision could fail to perceive at once. Those who

are blinded by the partial development and growth consequent upon misspent time are wont to quiet their consciences by staggering efforts at explanations such as these: "Oh! that is just my luck." "Yes, his dish is always right side up when it rains porridge;" thus attributing to a blind chance the regular results of earnest continued effort at ceaseless advancement and growth.

The truly professional mind is never satisfied with its present attainment. All who feel that there is nothing in the unknown and immediate future worthy of our highest ambition necessarily limit their desires and abilities for acquisition by the listlessness induced by the false conception.

Restless, undaunted effort is the price of all true and regular progress. Let us then set our stakes and peer into the darkness before us, until we develop increased acuteness and strength of vision, and then our pathway will be found to be all ablaze with the most satisfactory light, revealing secrets hidden from the foundation of the world which are ready to be recorded and taught to become first, common and then in turn laid aside as too trite to gratify the curiosity of the merest novice in the then schools of physiology and science in the general or specific methods of apprehension and instruction or understanding and promulgation.

REPORT OF THE COMMITTEE ON DENTAL LITERATURE.

BY GEO. T. BARKER.

To the members of the American Dental Association:

Gentlemen:—The undersigned, members of the Committee on Dental Literature, beg leave to present the following report:

Deeming it to have been the design of the Association that we should take cognizance only of such works and magazines as may have been issued subsequent to our ap-

pointment, we shall, therefore, briefly notice such additions to the Literature of our Profession as may have been made since the date of our appointment, August, 1860.

The first that we shall notice is a Practical Treatise on Mechanical Dentistry, by Joseph Richardson, D.D.S. M.D. This work is, we believe, the first and only one that has been issued, devoted exclusively to the mechanical branch of our specialty, and is deserving of a place in every Dental Library.

Part first is devoted to the consideration of the metals employed in the laboratory with preliminary observations on the different modes of applying heat. But, to us, the most valuable part of the work is that portion devoted to the subject of gold; its geographical situations, distributions and properties, the influence of alloying on the properties of gold; with a full and complete description of the process of refining; the alloys of gold for Dental purposes and the methods of converting gold alloys into the required forms for the Dentist. We are convinced that in no work yet offered to the Dental profession have these subjects been so fully and completely considered; and it must necessarily take a position as an invaluable adjunct to those who refine and melt their own precious metals. This part also treats of silver, platinum, aluminum, copper, zinc, lead, tin, antimony and bismuth, with the general properties of alloys and their treatment and behavior in the process of compounding.

The first chapter of part second is devoted to the treatment of the mouth preparatory to the introduction of artificial dentures, and we recommend it as worthy of careful study and perusal. The materials and methods employed in obtaining impressions of the mouth is next taken up, with full instructions in the necessary manipulations of this all important operation. The chapters on plaster models, metallic dies, partial and entire dentures, abound in instructive suggestions. The substances used in the manufacture of porcelain as applied to Dental purposes is next treated upon,

with instructions as to the methods of manufacturing porcelain block teeth, silicious compound, vulcanite base and cheaplastic metal, closing with an instructive chapter on the treatment and defects of palatal organs.

In the necessarily brief review of this work which we make, much has been passed over to which we might properly direct your attention; and while we consider it a valuable addition to Dental Literature we by no means consider but what it is susceptable of improvement. This is observable as a single instance in the chapter on the vulcanite base—marked and invaluable improvements having been recently made; some of them indeed, we believe, at the instance of the author of the work under consideration. The correctness of the numerous illustrations and general typography of the work reflect credit upon the publishers.

The next work which we shall notice is The Medical History and Treatment of the Diseases of the Teeth, and the adjacent structures, by Benjamin Ward Richardson, M.A. M.D., being a series of lectures delivered before the members of the College of Dentists of England in the session of 1858 and 1859.

The author of this work, though not a practicing Dentist, has presented to the Dental Profession a work of the highest order of merit, and suggestions and experience are offered in the field of Dental Pathology which are invaluable. The first lecture consists of a dissertation on the constitutional and general causes of some diseases of the teeth and the adjacent structures. The constitutional or systemic causes are, in this lecture, progressively considered in the following order. 1st. Hereditary diseases, or those diseases which pass from parent to offspring, and which are derived from simple derangement of the organism itself; and independently of any influence from without. 2d. Poisons, organic and inorganic, with their appropriate classification, alkalies, effects of eruptive diseases, malaria, syphalis, struma, rheumatic and gouty diathesis; closing with a summary of

the valuable instruction advanced. We would commend this to your earnest consideration, believing that Dr. Richardson has entered a field which has not until recently received its deserved attention from the Dental Profession either in Europe or America.

Lecture II. treats of the hemorrhagic diathesis in its bearings on Dental practice, with the best preventative and curative treatment in cases of obstinate and persistant hemorrhage.

Lecture III. treats of neuralgia in its relation to toothache and diseases of the teeth—the sensational force, structure of nerve tissue and functions of nerves being first alluded to, concluding with instructive observations as to symptoms, causes and treatment of this most painful affection. Lectures IV. and V. are devoted to the subjects of hysteria, dyspepsia, rheumatism and gout in their relations to some abnormal states of the teeth and neighboring organs, each subject being instructively and interestingly considered. Lecture VI. treats of diseases of infancy and childhood as dependant on and as influencing dentition. This desertation on this important subject is worthy of the most careful study, Dr. R. having presented to the Profession a concise and complete epitome of the views of the best writers, also detailing his own extended experience in the diseases incident to dentition. Purulent affections of the gums and adjacent structures are next taken up in Lecture VII., and important information is imparted to enable the practitioner to properly diagnose and treat this class of Dental disorders.

The subsequent lectures on malignant diseases involving the organs of mastication.

Diseases of the teeth and maxillary bones, arising from the effects of mercury, phosphorous, lead and other poisons, diet and modes of life in their influence on the organs of mastication, abound with important and valuable information to the earnest seeker after truth in Dental science.

This valuable work closes with a lecture on chloroform and

the narcotic remedial series, also one on the pathological and general history of necrosis, exostosis and caries.

This work must, as it deserves, take rank as a Dental text book in our colleges, but we consider that no Dental practitioner, let his experience or information be ever so great, can fail to read this production with attention without deriving important and valuable information therefrom.

We would next direct your attention to a work on chloroform and other anæsthetics, their action and administration, by John Snow, M.D., edited with a memoir of the author by B. W. Richardson, M.D. The following synopsis of the subjects treated upon will give a brief idea of the vast amount of valuable material to be found in this work. Chloroform, its history, composition, mode of preparation, chemical and physical properties, and its adulterations.

The physiological effects and circumstances which influence or modify the effect of chloroform, amount of vapor absorbed to cause the various degrees of narcotism. Preparations for inhalation, mode of administration, recovery from the effects and occasional sequelæ of the inhalation of chloroform. Causes and prevention of death, fatal cases of inhalation. Alleged fatal cases, symptoms in fatal cases, mode of death. The two kinds of syncope and supposed causes of death from chloroform, state of the chief organs after death, treatment of suspended animation, effect of chloroform on the results of operations. The inhalation of chloroform in medical cases, sulphuric ether, ameylene, and monochlorurreted chloride of ethyle.

The author of this work for many years previous to his decease devoted his time almost exclusively to the administration of anæsthetic agents, chloroform however being used more particularly by him, and the extended information gained both practically and theoretically is concisely and instructively considered. No one who would wish to keep pace with the advancement taking place in his profession should fail to peruse its contents, and to those who adminis-

ter anæsthetics it is an invaluable hand book for reference and advice. The number of experiments detailed most clearly prove that Dr. Snow has predicated his views upon no superficial basis but that they have been reached only by the most careful study and research. We were particularly gratified on perusing the work to read the following quotation which, coming from an Englishman, is worthy of particular notice, as the almost universal custom of that country is to decry sulphuric ether and advocate the use of chloroform as an anæsthetic agent.

"*Great safety of Ether.*—I believe that Ether is altogether incapable of causing the sudden death by paralysis of the heart, which has caused the accidents which have happened during the administration of chloroform. I have not been able to kill an animal in that manner with Ether even when I have made it boil, and administered the vapor almost pure. The heart has continued to beat after the natural breathing has ceased even when the vapor has been exhibited without air, and in all cases in which animals have been made to breath air saturated with Ether vapor, at the ordinary temperature of this country, they have always recovered if they were withdrawn from the vapor before the breathing ceased; if the animal made a gasping inspiration after its removal from the Ether it recovered."

"I hold it, therefore, to be almost impossible that a death from this agent can occur in the hands of a medical man who is applying it with ordinary intelligence and attention."

The following Dental Journals have been issued since our appointment and by the presentation of important and valuable material have contributed in no small degree to the advancement of the Dental Profession.

Monthlies.—Dental Register of the West, J. Taft, of Cincinnati, Publisher, and Dental Cosmas, S. S. White, of Philadelphia, Publisher.

Quarterlies.—The Vulcanite, published in New York by the American Hard Rubber Company.

New York Dental Journal, W. B. Roberts, of New York, Publisher. The following Quarterlies have been discontinued, American Journal of Dental Science and American Dental Review.

While we would not wish to be considered censorious it is nevertheless true that none of our Journals in a literary point of view represent the present *status* of the American Dental profession. That the Profession, as a body, are capable of presenting a more advanced style of Dental literature we do not for a moment doubt, but the contributions to the pages of our magazines are confined to comparatively a small body of writers.

When we consider how great a number are toiling in the field of Dental usefulness, and too many of these present their thoughts, crude and unprepared, when a moderate amount of toil and preparation would enhance their value, reflect credit upon the writer, and the Dental Profession. It is said, not we think with truth, that the old world is far in advance of us in the science of our Profession, while they accord to us a higher degree of perfection in the manipulative departments; this judgment being formed, we think, from our Dental literature. We would, however, urge the members of this Association and of the Profession at large to be satisfied with no rank but the highest, and to win it by proving that the science of our Profession is not disregarded for the practical departments, but that each receives our hearty support and cooperation. That we may awaken earnest laborers from a state of apathy and lethargy is our design in thus truthfully and unreservedly presenting our views on this important subject.

REPORT ON DENTAL CHEMISTRY.

BY J. TAFT.

In the presentation of a report upon this subject, your committee is constrained either to hastily and superficially examine a large scope of ground, or, if more minutely and thoroughly, then comparatively very few particulars can be brought within the range of this report.

What is the task you have assigned us? Is it to describe in what way and how far this, the greatest natural science, has aided the dentist? Or, is it to define how far it may yet be instrumental in developing dental science and art? In what particulars and to what extent our specialty shall be aided by it, who will predict?

The aid which dental science has received from chemistry may be comprehended, to some extent, when we attempt to consider what progress has, or would have, been made in the science of chemistry.

Chemistry is that science which teaches a knowledge of the properties of the elements of matter, and the laws that govern and regulate them.

This knowledge is attained by analysis and synthesis, or by decomposition and combination; and observing the behavior of the elements in these processes, and the results obtained thereby.

These processes, carried on independent of vitality, constitute that which is denominated inorganic chemistry, and when they are modified by vitality, it is then called organic chemistry; a still more circumscribed division is animal chemistry.

The extent to which the natural laws of the elements are modified under the influence of vitality, and the manner in which it is done, opens up a field far too vast for our present

purpose, had we the ability and you the patience to pursue the investigation. The object of your committee will be fully accomplished, if we can make some suggestions, that shall stimulate our professional brethren to a more extended and thorough investigation of this subject, and thus the more perfectly be enabled to make it yield a more ample tribute in the development of our noble science.

When we attempt to consider what progress would have been made in the science of dentistry, it is difficult to find a beginning place; its influence has been so great and so general, that it is self-evident upon the mere statement of the fact. In the preparation of materials for the use of the dentist, nothing is accomplished without chemistry; composition and decomposition enter largely into all the processes. If gold is impure, a separation must be effected; if it is too pure, a composition must be made; the former of these can only be done through a knowledge of the laws of affinity—the latter is only well accomplished through the knowledge of the results of various combinations. The chemistry of the metals is a vast field of study for the dentist; and though we would not presume to present, in this report, a full dissertation upon the proper treatment of the various metals employed in the dental art, suffice it for the present, however, to present a few practical thoughts upon some points connected therewith.

Of the sixty known elements, forty-seven are (denominated) metals, though about a few of these there has been some question, as to the propriety of calling them metals.

The behavior of the metals, with one another, and with the non-metallic metals constitutes the science of metallurgy.

Metal is an elementary body, which conducts heat and electricity with greater or less facility, and is more or less lustrous. The metals are all opaque. In color all the metals, except three, range between a bright white silver, and the blue white of lead.

Gold is of a rich yellow; copper and titanium red; the latter, when comminuted, is steel gray.

The metals differ much in the qualities of malleability, ductility, and tenacity. Gold is the most malleable of the metals.

Arsenicum and titanium occupy the opposite extreme; they may be pulverixed in the mortar. Malleability and ductility are not corresponding properties, some metals possessing the one, in a very marked degree, while the other is quite deficient. Tenacity is that property of metals which resists the separation of its particles by tension. Heat exercises a great influence upon tenacity; that influence, however, is not uniform—some it makes more tenacious, others less. Some metals must necessarily be wrought cold, others work far better when hot. Annealing usually adds to the malleability and ductility of metals; but by the frequent heating of some, silver for instance, they become crystalline, and, consequently, brittle. In regard to hardness, the metals vary exceedingly. Mercury is a subtle fluid, potassium cuts like wax; lead may be forged with a wooden mallet; some are harder than steel. This property may be increased by heating and cooling suddenly; it may be diminished by heating and cooling slowly. In some metals the extremes are produceable in this way. (Steel, perhaps, affords one of the best instances of these processes.)

Upon the control which the manufacturer exercises over this property, depends the value of thousands of implements prepared from the metals.

The method of arrangement of the ultimate particles of the metals, in the process of annealing and hardening, is one that would be very interesting for examination, but would, perhaps, be descending too much into detail for this report; it is a subject, however, upon which we hope investigation and elaboration will be made.

All metals may be rendered fluid—some fusing at a low

heat, and others, platinum, for instance, require the power of the oxyhydrogen blow-pipe.

Metals are the best conductors of heat and electricity; they vary very much, however, in this property; gold and platinum are, perhaps, the best conductors of heat; silver and copper the best conductors of electricity; platinum, perhaps, one of the poorest. A pure metal is always a better conductor than any of its alloys.

The term specific gravity is always correspondent with density. By specific gravity we determine something of the nature of a substance, both essential and comparative.

The densest bodies in nature are found amongst the metals. The specific gravity of metals is determined by a comparison with water. The method of making this comparison is, perhaps, familiar to you all, and need not be described here. For convenience, the metals may be divided, in respect to specific gravity, into two classes, viz., the heavy and light; those, the specific gravity of which range from 5, 3 to 21, 5 are denominated heavy, and those from about 1, 6 to 5, 3 may be called light. Platinum is an example of the former, and lithium of the latter. The specific gravity of an alloy is not always, and, perhaps, not generally, the mean of its components, though in many cases it is; an alloy of gold and silver is an example.

Chemical affinity is an inherent force in bodies, by which they are disposed to unite with one another, and form a new material. Affinity is only brought in play between bodies of different natures. Combination is the result of chemical affinity. There is a great difference between combination and mixture. Examples of the former we have in the union of non-metallic with metallic substances; infusing metals together, it is generally only mixture. The atmosphere furnishes an example of simple mixture, without affinity being brought at all into play. The power of affinity is exceedingly various; between some substances it is so great that it is with the utmost difficulty it can be overcome, indeed it is

quite probable that some substances hitherto and now regarded as elements are compounds that may, under a more extended chemical knowledge, become subjects of analysis. If a piece of silver is brought into contact with nitric acid, chemical action immediately takes place by the affinity of one of the elements of the acid for the silver.

The greater affinity between the silver and the oxygen causes the latter to forsake its first love, in part, at least, and the nitrogen, with a portion of oxygen, escapes in the form of nitrus oxia. The result of the union of the oxygen and silver is oxyd of silver, but the process does not cease here; there is a strong affinity between the oxyd of silver and the nitric acid, and from this the nitrate of silver is the result.

Heat, light, and electricity modify chemical affinity, under some circumstances promoting it, under others destroying it. In *mixtures* the proportions of the components are indefinite. In *chemical* compounds the elements are definite in nature and constitution, and a fixed ratio is maintained. The combining quantity of a compound is the sum of the combining quantities of its constituents; for instance, in the formation of nitrate of silver, the combining number or equivalent of silver is 108; that of oxygen, 8; hence the oxyd of silver 116; this, then, unites with one equivalent of nitric acid, the combining number of which is 54, which, when united to one equivalent of the oxyd of silver (116) is 170—the equivalent of nitrate of silver. Now these proportions can not be changed in the least, without changing the nature of the material. The principles here hinted at form the basis of all chemical and metallurgic operations, and no one can intelligently proceed without a thorough knowledge of them.

Union of non-metallic elements with the metals.

By far the most frequent combination of this kind is that of the metals with oxygen; these are termed oxyds: these exist either naturally, as in the ores of many metals, or are formed spontaneously, by the exposure of the metals to air or moisture, or are produced artificially.

There are several methods of producing metallic oxyds: 1st. The heating of many of the metals in air, or oxygen, converts them into oxyds. 2d. By heating the salt of a metal, the nitrate for example, the acid will be driven off, and the oxyd left. 3d. By dissolving a metallic salt in water, then precipitate the oxyd by an alkali.

Thus metallic oxyds are produced.

For the reduction of the metallic oxyds, various means are employed, depending, to a great extent, upon the character of the metal and its affinity for oxygen. From gold, silver and platinum, heat alone will effect a separation of oxygen. Again, there are oxyds of other metals which require the addition of some other materials having a stronger affinity for oxygen, which (affinity) is increased and facilitated, by the application of heat. The heat accomplishes this in two or three ways, and, first, usually by liquefying the added material, thus enabling it to come in most intimate contact with metallic compounds; and, second, by facilitating the liberation of the elements, that is to accomplish the work, from its former connection, thus giving it the most perfect freedom of action.

There are other metals, the oxyds of which are reducible most readily, by being placed in a glass tube, and heated to redness, and then passing a current of dry hydrogen gas over them; the hydrogen takes up the oxygen, forming water, and the metal is left free. In cases where this method has not sufficient power to affect a separation, a second metal may be employed, whose affinity for oxygen is greater than that of the metal to be separated. Again there are metals whose affinity for oxygen is so great as to be only overcome by the galvanic current, it being one of the most powerful decomposing agencies. Any material to be acted upon thus must be soluble in water.

Chlorides.

There is a very strong affinity between the metals and chlorine, even exceeding that between the metals and oxygen; and hence chlorine will unite with many metals, with far more energy than oxygen. The chlorides vary much in color, and are mostly soluble in water; a few are insoluble, of which the chloride of silver is an example; the chloride of gold is soluble upon the addition of a small quantity of water. All metals unite readily and rapidly with chlorine under the influence of heat. Chlorine, under favorable circumstances, brought to bear upon an oxyd, will dispossess the oxygen and take its place. Many metals, whose chlorides are soluble in water, may be dissolved at once in hydrochloric acid; there are, however, some exceptions, as the chlorides of gold and platinum. The ordinary method of obtaining the chlorides of these metals is by hydrochloric acid, to which a small portion of nitric acid has been added.

In the reduction of chlorides, those of gold and platinum only are decomposed by heat; unless moisture is present, then, with many, it will readily take place. A current of hydrogen, thrown on a heated chloride will reduce it. Some chlorides are readily reduced, by heating with a metal having a stronger affinity for the chlorine.

The combinations of the metals with sulphur are very common, and it is from these that many of the metals are derived. The production of this combination is easily accomplished, and need hardly be repeated here. For the reduction of the sulphides, simply heating them in the air will suffice for many of them; some will be reduced by throwing a current of hydrogen upon them, at a red heat.

Chlorine will also decompose them; nitric acid will accomcomplish the same result with many of them.

Another important combination is that of iron with carbon.

This is, perhaps, of more importance and value to the world than any other metallic combination; by it cast iron and steel are formed.

The amount of carbon that may be combined with iron varies very much; the finer kinds of soft iron have about 0.10 per cent. carbon, soft steel 0.6 to 0.8 per cent. carbon; the ordinary steel 1.00 per cent.; in hard steel 1.10, and in the hardest 1.70 per cent.; in the ordinary English steel 1.90 per cent. In preparing steel, the object is to introduce just enough carbon to give it the required hardness and toughness. Cast iron has a far larger proportion of carbon than steel; it has from 2.30 per cent. to 3.20 per cent. The greater amount of carbon contained, the more fusible will the metal be, hence steel is more fusible than the ordinary soft iron. The method of preparing the different kinds of steel, we do not propose now to describe.

The blistered steel (this is the name given to it after it is first carbonized), is not fit for fine cutting instruments, from the fact that there is not an equal distribution of carbon through the bar, decreasing continually from the surface to the center. This difficulty is not remedied by hammering or lapping and welding, for however much it may be wrought in this way, there will still exist the alternate strata of hard and soft steel. Henee the necessity for another process, to obtain uniformity of texture and hardness; this consists in melting. The process of melting and casting steel is very simple.

Pieces of steel are put into a stourbridge clay pot; it is then sealed up tightly and subjected to an intense heat for three or four hours; the metal is then poured into an ingot mould; by this means the mass is rendered homogeneous it is in the ingot, however, of crystalline structure, and in order to change this condition, it must be heated and well hammered; carefully at first, till the granular particles are elongated into fibers and are rendered more coherent; the

bar is finally finished under the tilt hammer or in the rolling mill.

All kinds of steel are improved by working under the hammer; it affects a greater degree of condensation, as well as produeing a structural change of the granular particles.

Alloys of steel with rhodium, silver or cromium, in small quantities, are esteemed very valuable for many purposes, especially for fine cutting instruments. It has also been alloyed with titanium; this is said to make superior instruments. Alloys of steel have not been largely experimented upon; there is, however, a large and interesting field for useful experiment and investigation.

Recently an effort has been made and crowned with success, too, to prepare steel from the finer kinds of cast iron, by simply reducing the carbon to the required amount.

The methods of working steel, tempering, etc., are points of vast importance, but it would much exceed our plan to enter these details.

There are many other combinations the examination of which would be interesting, but we have briefly discussed the more important.

Combinations of metals with each other.

This is a subject of vast extent, intense interest, and great value. It is not only so to the dentist, but to all engaged in the arts, at least where metals are at all involved—and those in which they are not very few indeed.

Combinations or mixtures of metals are called alloys, except those into which mercury enters, which are called amalgams.

Fusion is necessary for the formation of alloys. They have properties in some respects similar to the metals of which they are formed, though in many they differ; the color

is usually changed and the hardness increased, and they are more sonorous; this is so even when the components are soft and without resonance.

Tenacity, malleability and ductility are always less in alloys than in their constituents.

The toughness of alloys, by which we will include the three properties just named, is usually regulated by the affinity existing between the metals of which they are composed. Where there is no affinity between the ultimate particles of metals that are mixed, the granules do not come in so close relation or contact with one another as though an affinity existed; they do not lock in each others embrace; their edges and angles are presented to one other, so that there is necessarily little cohesion, and the tendency of each metal is to a more granular condition than when alone, and, consequently the particles are more easily sundered than if they incline more to the fibrous structure.

The point of fusion of alloys is usually below the mean of the constituents. This is also governed by the principle just above referred to. If there is a feeble affinity between the metals, a comparatively low degree of heat serves to break it, and the particles roll off into liquidity.

A mean specific gravity is not always obtained in an alloy, indeed it is very frequently at variance with it; this is also dependent upon and governed by the affinity existing between the metals; the less the affinity the less the density, and, consequently, less specific gravity.

Alloys have greater affinity for oxygen than their constituents, and, from this fact, they will be continually undergoing change by frequent melting. This is especially true of those alloys, the constituents of which vary much in their affinity for oxygen, and have little or no affinity for one another. The rapidity of this change of proportions will correspond to the difference of affinities for oxygen and the frequency with which the alloy is fused, and the degree of heat to which it is subjected.

Perhaps in the majority of cases alloys are simple mixtures, or at most the constituents have very feeble affinities, and, hence, they are readily separated under favorable circumstances. It often requires great care to effect a perfect mixture; this is especially the case where there is a great difference in the fusibility or specific gravity and oxydation of the metals to be mixed; hence it is necessary to agitate thoroughly at the time of mixing, and sometimes to exclude from the air by a covering of charcoal or similar substance.

By the combinations of metals, conditions and properties are obtained that render them better adapted for certain purposes than any simple metal; their fusibility is at a lower degree of heat than that of the constituents; advantage is taken of this fact in the production of solders.

All metals in passing from a state of fusion to solidity contract; alloys vary much in this particular, some contract none at all, others expand, and others contract very much.

Alloys usually possess a high degree of fluidity when fused, hence they are always used when sharp or definite casting is required.

The principle advantages of alloys may be summed up as follows, viz:

Increased hardness.

Fusion at a low heat.

An absence of contraction on passing from a fluid to a solid state, on cooling.

Sharpness and definiteness of outline.

We can not refrain here from directing attention to the researches and experiments upon the subject of alloys by our worthy brother Dr. B. Wood.

We have only attempted, in the foregoing, to present a few thoughts involving fundamental principles upon some subjects having an intimate connection with dental science

and practice. We would here acknowledge our indebtedness to the various authors upon whose writings we have drawn so freely in the preparation of this report.

Your committee can not but express the desire and hope that, in future, this committee may consist of those whose attainments and industry will enable them to elaborate something more worthy of your consideration.

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